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The Chemical Age

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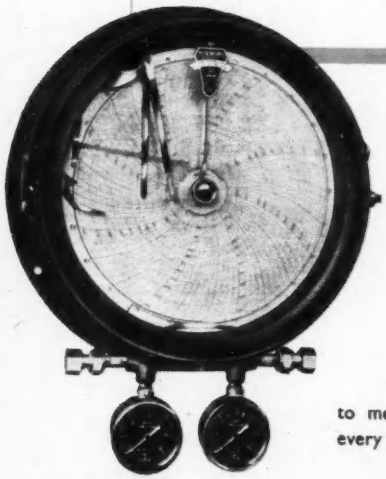
FOXBORO

INSTRUMENTS



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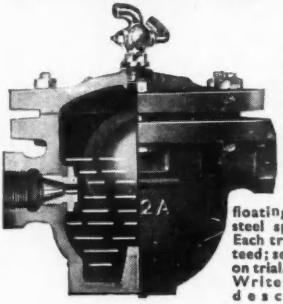

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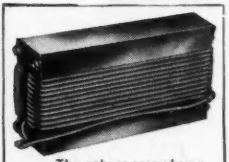

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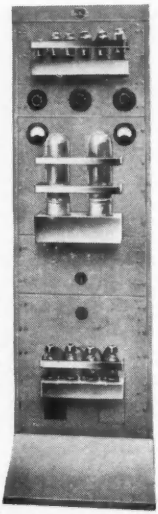

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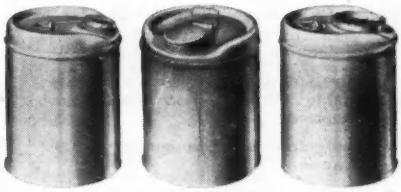

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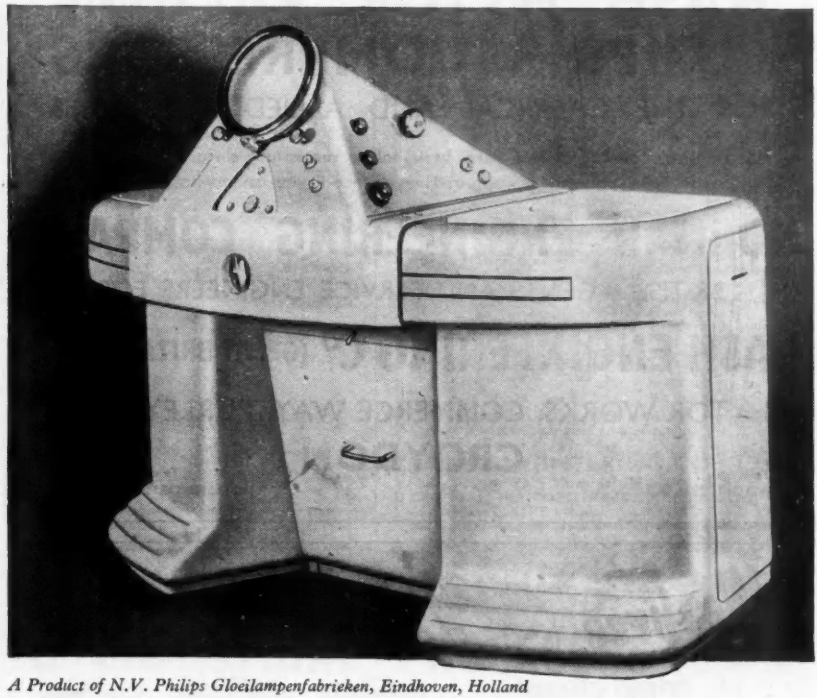

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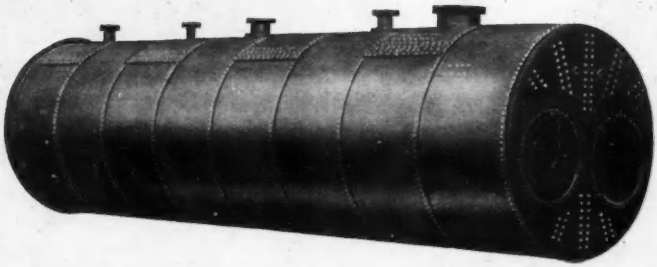

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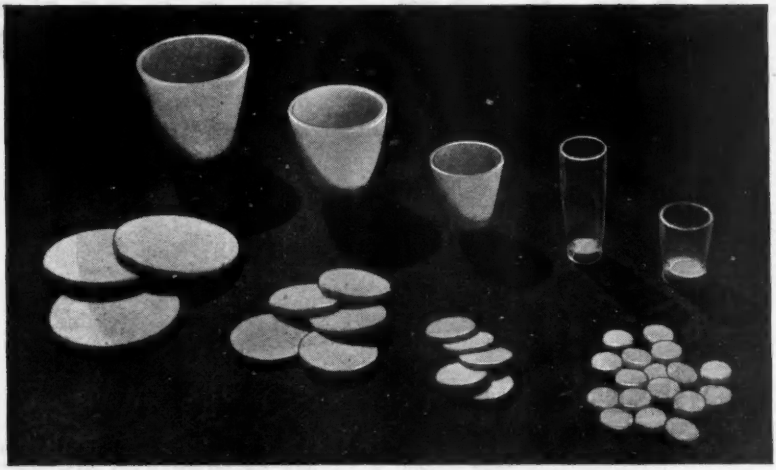

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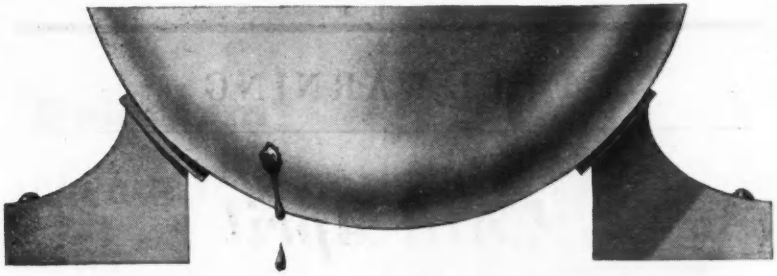

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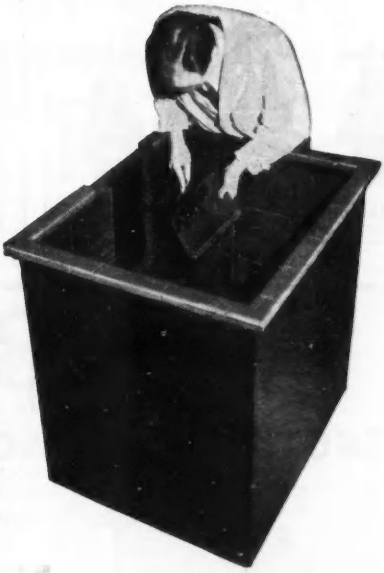

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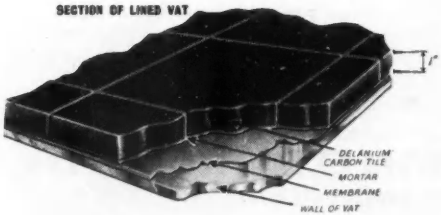

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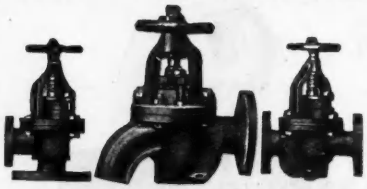

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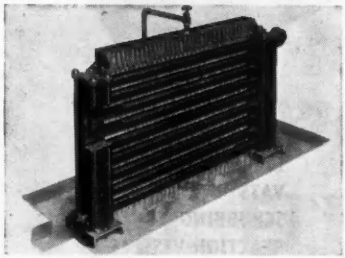

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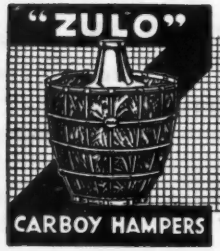

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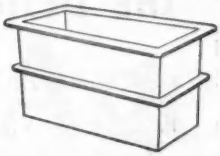

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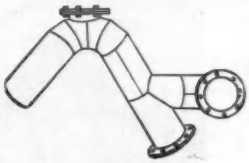

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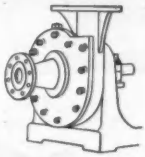

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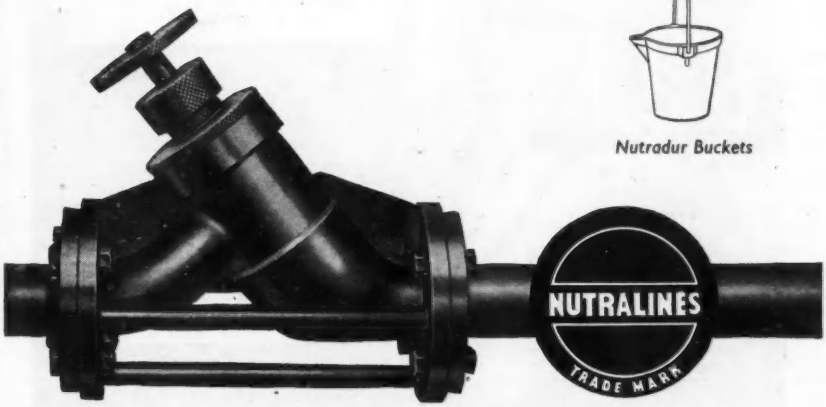

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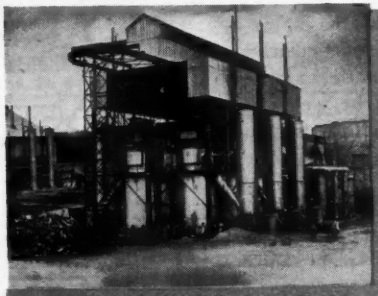

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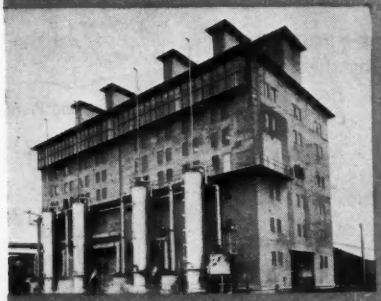

A four unit P.G. Semi Water Gas Plant using Oxygen and gasifying coke.
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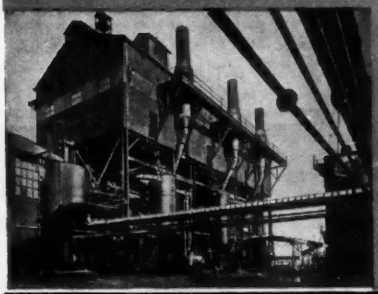

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The Chemical Age

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Chemistry & Crocks

THE heading 'Chemistry and Crocks' may suggest a topical commentary upon problems of labour dilution but any such impression must be hastily dispelled and blamed upon the incongruous versatility of the English language. The crocks of this context are the dishes and plates and cups of catering establishments, a subject which has been made no less topical by the recent publication of the Working Party's Report on 'Hygiene in Catering Establishments' (HMSO, February 1951, 1s. 9d.). Only a few weeks ago (see THE CHEMICAL AGE, 27 January, 1951, p. 159) attention was drawn to a recent American survey of the chemicals used in commercial bottle-washing. This new British Report, which obviously and properly foreshadows an increased official interest in catering hygiene, shows that another expansive and everyday market for chemicals is to be found in the washing-up departments of caterers' kitchens. A generation ago the task of dish-washing would have been looked upon as a combined operation of vague quantities of hot water, soap, and soda and rather less uncertain quantities of elbow grease and perseverance. In this new Report rather more than one-fifth of the total text deals with the chemical aspects of dish-washing. Indeed, so technical has this operation become, that the Working Party set up a special Advisory Committee composed largely of chemists to report upon the use of detergents.

The efficient dish-washing compound must fulfil a number of conditions. It must remove and prevent the redeposition of food residues. It must wet glass, china, and metal surfaces readily so that it also rinses freely. It must not attack the material of cooking utensils nor damage decorated crockery. It must not precipitate scum or scale with hard water. And it must not affect the worker's health nor damage the skin when hand-washing methods are used. The ideal dish-washing process has three stages. First, a gross pre-rinse with hot water; here temperatures above 140° F. may coagulate proteins and harden carbohydrates while temperatures below 120° are too low to remove fats easily. Second, treatment in hot water containing an effective concentration of a detergent preparation; the temperature should be kept above 130° and to avoid dilution of the detergent there should be an automatic system of maintaining the proper concentration. Third, an efficient rinse to ensure good bacteriological standards and quick drying. Final drying with a cloth is undesirable. Machine-washing is preferable to hand-washing as higher temperatures can be used and there is less need to consider the irritant effects of detergents upon workers' hands, a

subject upon which there is apparently a lack of medical knowledge. However, machine models now in use have in many cases been designed before modern surface-active detergents were available; some types must use predominantly alkali-based washing compounds as excessive frothing is caused when synthetic organic detergents are employed. One of the Committee's recommendations is that new machines should be designed so that detergent preparations can be fully and effectively used.

Both the Working Party and the technical committee were disturbed by the variety of detergent preparations on the market. There is a lack of standards to estimate the efficiency of these products and many are sold under proprietary names without indication of their composition either in qualitative or quantitative terms. The Working Party concluded that managements of catering establishments have no reliable information to guide them in their choice of suitable detergents and that there is as a result much haphazard use. The technical committee reported that the development of detergents will inevitably be restricted unless great care is taken in the formulation of standards for these preparations; the setting-up of an official body with powers to approve proprietary dish-washing detergents was recommended. A standard for the washing solution was suggested—that is, when a compound is diluted according to the manufacturer's instructions the solution given should conform to certain requirements. Its *p*H should be between 10.0 and 12.5 for a machine-washing preparation and between 10.0 and 11.5 for a hand-washing preparation. For use with hard water a sequestering agent should be included, e.g. polyphosphates to provide a minimum of 0.015 per cent (as P_2O_5) in the solution. Silicates should be included because of their protective action on metals, especially when there is contact with aluminium; here the minimum amount should give 0.03 per cent (as SiO_2) in the solution. Nevertheless, the difficulties of evolving an effective performance test for detergent preparations was pointed out.

For uncompounded synthetic detergents, e.g. the polyethylene condensation products, the alkyl sulphates, and alkyl aryl sulphonates, many products are marketed at 20-40 per cent dilutions of the active constituent. The committee recommended that washing solutions should contain 0.02 to 0.07 per cent of the 'true surface-active agent' and that manufacturers should issue suitable instructions for use with these products. The Working Party's recommendations on this point are perhaps more emphatic. They ask that the composition of detergents should be quantitatively stated as simply as possible and that definite instructions should be given on the necessary dilutions for effective action under different conditions. For compounded detergent products and for compounded soap powders, the technical committee considered that the now revoked Ministry of Food specifications under the Soap Substitutes Order of 1943 and

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Notes & Comments

A Synthetic Paradox

THE synthesis of ammonia from atmospheric nitrogen and prepared hydrogen has long been regarded as one of the greatest achievements of the chemical industry. Nothing would seem more futile than using ammonia as a raw material for hydrogen production, especially when the chances are that the ammonia has in the first place been synthesised. Nevertheless, this is proving an economic development for small-scale users of hydrogen in America. The dissociation of ammonia gas is easily obtained by passage through a heated chamber, approximately 1,650°-1,850° F. Catalysts are used to ensure complete dissociation. It is said that as little as 0.01 per cent residual ammonia results from catalytic dissociation. Nickel shot or iron oxide is being used, but it is believed that the actual catalytic agent is a metal nitride formed from the metal and the nitrogen produced in the dissociation. At least six companies are making equipment for this process. The plant is automatic in control and the heat in the dissociated gas stream is re-utilised to vaporise the liquid ammonia. It may seem difficult to believe that this reversal of a synthesis could ever be economic as a means of obtaining a supply of an element. But transport cost is one critical factor. A cylinder holding 150 lb. of hydrous liquid ammonia will give 6,750 cubic feet of dissociated gas. Factories using 8,000 cubic feet of hydrogen per day (or less) would find (a) costs of a hydrogen-producing plant or (b) total costs of buying cylinder hydrogen both higher than costs of running a small ammonia-dissociation plant. It is possible that the long transport of materials which U.S. manufacturers so often have to face is an economic influence British users of hydrogen would experience much less. There is, however, another important factor, especially in comparing the costs of ammonia-derived hydrogen with those of a small hydrogen-producing plant; the dissociated hydrogen is much more easily freed from impurities and for some processes this may be an overriding consideration. In the United States the introduction of this paradoxical process for hydrogen is particularly interesting hydrogenators of fats and oils.

Commercial Fertilisers

THE Delaney Committee in Washington—not to be confused with the Food and Drugs Administration which has also been holding hearings on the subject of pesticide residues—has been examining the pros and cons of fertilisers. This body is a committee set up by Congress, and its report not unnaturally carries authoritative weight. In America as in this country an active minority has long been attacking fertilisers and advocating total reliance upon 'organic' materials. If ever this school of thought had a first-class platform from which to convince public opinion it was before the Delaney Committee last December. The leader of the organic school in the United States, J. I. Rodale, editor of *Organic Gardening*, told the committee that all chemical fertilisers were dangerous to crops and human health and that in their place such materials as leather dust, ground rocks, bone meal, dried blood, leaves, weeds, and other natural residues should be used. He blamed fertilisers for lowering health standards. To all who have read the anti-fertiliser literature, whether in America, England, or South Africa, these indictments will have a familiar ring. It is noteworthy, therefore, to learn that the first interim report of the Delaney committee includes the following sentence: 'No reliable evidence was presented that the use of chemical fertilisers has had a harmful or deleterious effect on the health of man or animal.' This conclusion may be compared with that of the British Parliamentary and Scientific Committee in their 1944 Report upon agriculture: 'Practical farmers are . . . right in their tenacious faith in organic manures; that is, farmyard manure, crop residues, and other kinds. Science is no less insistent on their importance. Artificial fertilisers

are not a substitute for but a supplement to . . . organic manures. The proper use of fertilisers does not poison soils; it enriches them.' Nor did the organic and anti-fertiliser school fare any better in 1939 when Viscount Astor and Seebohm Rowntree set up a private committee of independent experts to survey British agriculture and its problems. Their earlier report of this kind had been criticised for ignoring the evidence against fertilisers and the 1939 report included special consideration of this issue. 'The evidence to substantiate these claims (i.e. the charges that fertilisers are harmful to soils, crops, and health) seems inadequate and certainly all the vital statistics seem to indicate that disease among human beings, far from increasing, is decreasing. . . . There seems to be no evidence of any mysterious substances or quality in humus which would affect the health value of plants other than nutrients which could be supplied by ordinary commercial fertilisers.' The record of the organic school so far as independent committees are concerned would seem signally unimpressive.

A *Cautious Success*

UNDERGROUND gasification of coal has been the object of investigation in various countries for many years. Great Britain, in fact, led the field when it was first tried by Sir William Ramsey in Durham in 1912, but further developments were then postponed by the first world war. Since then the matter hardly seems to have developed beyond the experimental stage. While the trials begun at Newman Spinney, near Chesterfield, in July last year, have now been considered sufficiently successful to warrant an expansion of the work and further experimental trials elsewhere, it seems a pity that the 'interesting information' released this week could not be more fully amplified. All questions were met with great caution. The project must still be regarded as experimental, and it would not be advisable to prophecy. It could not be stated how long it would be before gasification might be adapted to commercial purposes, and, finally, it must be regarded as a possible augmentation to conventional methods rather than as an alternative. While admittedly too optimistic a forecast might later lead to disillusionment, it does seem that the experts, having taken the trouble to invite the Press to hear their news, might have been a little less guarded in the release of their 'interesting information.' It also seems rather to be deplored that no further technical details can be obtained until after the publication of the second part of the technical report to be published in the March issue of the *Journal of the Institute of Fuel.*

Chemistry & Crocks

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the Soap (Licensing of Manufacturers and Rationing) Order of 1949 were largely satisfactory standards.

A somewhat more difficult washing problem is that of glass-cleaning in licensed premises. This task is seriously handicapped because it must in so many cases be carried out in a one-sink, one-stage process. The Report reveals, however, that research by the Institute of Brewing has made promising progress. The ideal product for use in bar sinks must be both detergent and germicidal. It must be non-irritant, odourless, tasteless, bacteriologically non-selective, non-foaming in the sink, without effect upon the head of beer and devoid of beer haze-forming properties, non-corrosive to pewter, and free of slippery after-effects on glass surfaces.

The commercial sink is clearly a considerable challenge to the chemist. It is probably too early yet to introduce specifications for organic detergents; such regulations, to be worth anything at all, must impose a good deal of rigidity upon formulation. To attempt this in the childhood of a new development in applied chemistry is to stunt and stultify future growth. It is better to risk some commercial misrepresentation (which will soon be detected by the competent buyer) than to risk the loss of steady progress. But even the chemist may yet wilt before some sturdy Mrs. Mopp of the kitchen brigade who pulls a plate out of her unscientifically controlled sink and says: 'Just you tell me *that* isn't clean!'

Salt as a Fertiliser

Specially Contributed

THE position of common salt as a fertiliser is quite unique and any discussion of this subject must be based considerably upon historical records. Long before our present day chemical fertilisers were known salt was being widely used; it is hardly an exaggeration to say that for centuries it was the only material used as a soil amendment and describable in the modern sense of the term as a fertiliser. Yet later, when fertiliser use expanded, interest in salt declined. 'It would be, perhaps, difficult to name any other substance in the catalogue of modern fertilisers whose powers have been so often and so warmly disputed as common salt . . . .' That is not a quotation from contemporary literature. It is from Cuthbert Johnson's book on fertilisers published in 1839. The date has exceptional significance —for it was in the period 1840-45 that both the science and industry of fertilisers as we know them today started.

The virtues of salt for the soil and crops are referred to in the Bible, by Cato and Virgil, and with great frequency in the agricultural records until the 17th century.

In that century, however, the use of salt in British farming was brought to a sudden and regrettable halt when it was subjected to a heavy war tax by William III's government. The price of salt rose from 6d. to more than £1 a bushel. It was impossible to use a material that had become so costly. This extraordinarily heavy tax was not repealed until 1823. So, for almost a century and a half, the use of salt as a farm fertiliser was suspended and practical knowledge from former experience with salt was gradually forgotten.

No Comprehensive Theory

Fortunately the repeal of the tax came at a time when farmers were exceptionally enterprising in experiments with possible fertiliser materials. There was still no comprehensive theory of plant nutrition to guide agriculturists; Liebig's famous mineral theory was not to come until nearly 20 years later. But chemists had already begun to interest themselves in farming processes, notably Humphrey Davy. All sorts of materials were being tried as 'manures' and salt, liberated from its tax, took a major position in the somewhat haphazard list.

In this period of vigorous revival, numbers of successful tests with salt were reported—for wheat, barley, oats, turnips, mangolds, potatoes, and grass. It is impossible today to assess their real value. They were conducted by farmers or landowners; the necessary controls over other crop-influential factors may not have been suitably regulated. No single test from this period could be put forward today as valid evidence. Yet the total weight of evidence cannot be ignored.

Successful Tests Reported

Not all these tests showing that dressings of salt improved yields can have been wrong. What might be called a 'Gallup Poll' validity can be legitimately granted. The 19th century position of salt in agriculture was well summarised in 1863 by two essays promoted by the Salt Chamber of Commerce of Northwich; an appendix to Falk's £50 prize-winning essay gives a remarkable number of successful British and German results from tests with salt.

Nevertheless, the use of salt as a fertiliser was not easily expanded. Liebig's mineral theory of nutrition (1840) might well have supported the argument for salt, for Liebig himself assumed that all mineral elements found in the ashes of plants had come from the soil and that they had all exercised growth-promoting influences. This would certainly have given sodium a respected position, but Liebig's ideas were developed in detail by the culture of plants in simple solutions; his followers, using this academic method, soon produced a short list of elements that were essential to plant growth.

The list was indeed short; without 20th century methods of analysis, the trace-elements (recognised from 1920 onwards) were completely disregarded. Sodium, though occurring often enough in plant ashes, was not found essential in the plant-supporting culture solutions and it was therefore omitted from the 'fertiliser element' list. Chlorine, too, was found a non-essential.

Those who advocated the use of salt could thus obtain no support from the scientists; and at that time, as new scientific fertilisers like superphosphate had proved so successful, the chemist's reputation in agriculture stood very high. This offset all the practical evidence of the past and the new evidence from tests after 1823. Yet many crops regularly received sodium dressings. The most heavily used nitrogenous fertiliser at that time was Chilean nitrate of soda; sulphate of ammonia had yet to develop at all appreciably.

Low-Grade Potash Salts

Later, with the introduction of potassic fertilisers, it was low-grade potash salts that were mainly used and these carried substantial quantities of sodium chloride with their 10-30 per cent of potash. For one crop at any rate the use of salt persisted despite the rulings of the chemists. This was mangolds; the beneficial effects of salt for this crop were too widely known. The conventional explanation of this anomaly was that mangolds were originally a marine or sea-shore crop and therefore had a natural predilection to absorb salt.

Broadly, this attitude to salt remained unchanged until a few years ago. There was one period of increased interest—1914-1918. All potash then being centred in the German mines, acute potash scarcities developed in this country. Salt was considerably used as a substitute fertiliser in the hope that sodium ions could displace potassium ions from complex potassic reserves in soils. This hope was sometimes fulfilled for one or two seasons; but afterwards this beneficial influence of salt fell away, there being no more sodium-displaceable potassium in the soil reserves.

The emergency utilisation of salt gained it little credit. The very fact that the response to salt declined in a season or two suggested that salt had no plant-feeding value in its own right, but only a speculative and indirect value as a displacer of fixed potash. Unfortunately most of these wartime experiences were concerned with the all-important potato crop; there was much less experimenting with salt for crops which have since been shown to be particularly responsive to sodium.

With peace and the return of potash supplies from Europe, interest in salt rapidly waned. Its agricultural uses were again confined to fertilising mangolds, weed-killing with excessive dressings of salt, hay and other fodder conserving, and a few minor purposes. The opening words of the introduction to the Northwich Salt Chamber's publication of essays were as true in 1938 as in 1863: 'The use of salt in agriculture has hitherto been comparatively so limited although its value has been admitted at all hands. . . .' The only difference was that there were considerably fewer hands prepared to admit its value in the 20th century.

Only a few years ago, however, proof that sodium could increase a crop's economic yield emerged from joint research by Rothamsted and the British Sugar Beet Corporation. Salt dressings of 5 cwt. per acre substantially increased the yield of sugar-beet per acre and particularly the yield of sugar per acre. The effect, shown in numbers of field tests, could not be potash-substitution, for it was displayed in the presence of adequate potash. Nor was it a chlorine effect, for when nitrate of soda was used as the source of nitrogen for this crop, the beneficial effect of the salt dressings was reduced; in short, with sodium being supplied in nitrate of soda dressings, less sodium was needed from salt dressings.

The value of salt as a sugar-beet fertiliser is now well known; the practice of dressing sugar-beet soils with salt some weeks before sowing has become firmly established in a few years. Roughly 5 cwt. of salt per acre may produce as much as 5 extra cwt. of sugar. For so long neglected a plant nutrient as sodium, this is certainly impressive.

Development Arrived Suddenly

This development arrived remarkably suddenly in Britain, but there had for some years been a considerable amount of experimental work in Europe where sugar beet industries were longer established. Indeed, a study of the literature on this salt-beet-sugar relationship provides many indications in the 1925-1945 period, particularly in German and Dutch papers. The British work, however, was probably the most decisive and clear-cut field research. (*British Sugar Beet Review*, 1947, *16*, 19. E. M. Crowther.) In Holland, J. J. Lehr had produced similar field evidence in tests between 1940 and 1942. (*Soil Science*, 1941, *52*, 3, 237; 1942, *53*, 5, 399; and 1947, *63*, 6, 479.)

Such evidence, although for a single crop, might have been expected to stimulate widespread interest in the virtues of sodium as a nutrient and salt as a straight fertiliser. On the whole, however, it was received in the spirit of an 'exception' and the old 'rule' that sodium is not an essential nutrient for plant life was undisturbed. Yet there was already well-established American evidence that sodium was an important nutrient for cotton (a 1943 paper gives test data covering the period 1931-1942); and Harmer, also in the United States, had shown in tests between 1932 and 1937 on highly organic market garden soils that salt significantly increased the yields of celery, turnips, cabbages, Swiss chard, and vegetable beets.

In all this modern evidence the sodium effect was in addition to the normal fertilising effect of potassium. It seems clear, therefore, that certain crops will respond to sodium, not as an essential element but as an element required for maximum production. Research is badly needed for distinguishing with fair certainty between (a) crops that require sodium for maximum yields, (b) crops that respond to sodium only moderately and perhaps only because potassium is inadequately present, and (c) crops that do not respond to sodium significantly. The various beets, mangolds, and cotton can already be placed in class (a), but there are plenty of indications that other crops should also enter this group.

The reaction of cereal crops to salt or other sources of sodium particularly requires a complete re-investigation. For wheat and barley there is abundant 19th century evidence; modern American research has found a definite but moderate response of cereals to salt, but the extent of these 20th century investigations has been very limited.

Study Complicated

The study of sodium as a nutrient is certain to be complicated. In the case of sugar-beet its effect is so marked that field tests, once initiated, are certain to produce an equally marked conclusion. But salt, less costly than most fertiliser materials, would be an economic agricultural substance for yield-effects considerably smaller than those produced with beet or mangolds. There is reason to suppose that salt has other beneficial influences than those attributable to sodium as a direct plant nutrient. There is the temporary soil displacement of potash; it is also believed that sodium can partially undertake some of the functions of potassium in plant life; more important still, salt has a beneficial influence upon the soil-crop-moisture relationship, especially under dry conditions.

Thus, apart from the direct effects of sodium supply to the plant, tests may measure one or other of these additional, less direct influences. Modern agricultural research is in a better position to study sodium, however, as a result of the flame photometric method for sodium estimation. Previously, the analytical methods for estimating sodium in plants have not been as satisfactory as those employed for most other nutrients. 'It is perhaps for this reason that, in most soil fertility studies, sodium has usually been neglected . . .' is a not irrelevant comment from 'Diagnostic Techniques for Soils and Crops' (1948, American Potash Institute).

A Paradoxical Fact

It is paradoxical that sodium should be quantitatively more important than potassium in animal feeding, yet apparently so much less important in crop feeding. Although potash benefits the growth of fodder crops and grass, there is some evidence that high potassic fertilisation produces health disorders in cattle.

Is not more attention to sodium in animal feed crops indicated? In humid region soils the amount of soluble or available sodium is rarely more than 50 lb. in 2,000,000 lb. of soil. Is the salt-lick the best method of meeting the animal's sodium needs?

Expansion of the use of salt in agriculture would not be difficult for Britain. The reserves of salt have been estimated at a minimum figure of 15,000 million tons. The main centre of salt production—Cheshire—has an area of 20 square miles containing salt beds that in places reach a thickness of 90 ft. or more; one foot of salt over a square mile represents a reserve of more than one million tons. Moreover, there are additional and large deposits in Lancashire and Durham as well as a number of minor deposits in other countries. Few minerals are more abundant in this country than salt.

One of the older and largest salt-producing companies has in recent years developed agricultural salt-spreading services on the

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Easing of Production Bans

New German Trade Agreements

NEGOTIATIONS have recently taken place between the Federal Government and the Allied High Commission on the abolition of restrictions on the production of certain strategic chemicals in West German territory. The publicity campaign of the German chemical industry in favour of relaxation of these restrictions has been increased during the past few weeks. President Menne, of the Federation of the Chemical Industry, at a Press conference early this month stressed particularly the need for lifting of controls on the production of chlorine and caustic soda, the case for utilising the idle Fischer-Tropsch plants, and the manufacture of synthetic rubber.

Chemical Requirements

The Federal Government has supported this plea and made further detailed suggestions concerning other chemical productions. The present demand for chlorine is stated to be 1,000 tons a year above the permitted maximum capacity. The permitted production of ammonia is sufficient to meet all domestic needs, but it is argued that in present circumstances the German producers should be allowed to make a contribution towards meeting the requirements of foreign markets; highly-concentrated nitric acid was of direct use only for war purposes, and there was no need therefore for restrictions on making synthetic ammonia as such.

Consent of the Allied High Commission for the erection of a white phosphorus plant has also been sought and a request made that the output ceiling on styrene—20,000 tons a year—should be lifted. In future the Allied authorities should be content to receive advance notification of any plans for extending chlorine, ammonia, phosphorus and styrene capacities and not insist on production permits being obtained beforehand for any such extensions.

In the field of coal-oil chemistry German official and private circles are at present concentrating on securing permission for resumption of operations in the Bergkamen F-T plant and, later, in the other West German F-T works. While the demand for resumption of operations in the hydrogenation plants had been based on the argument that these could treat mineral oils and residues and thus help to overcome the shortage of refining and cracking capacity in Western Europe, the plea in favour of reopening of F-T plants is based on the grounds that the latter could provide fatty acids, high melting-point paraffins and raw materials for the production of synthetic rubber.

Because of the continuing coal shortage, the proposed reopening of F-T plants could hardly take place for some months; several companies, however, claim that the economic problems which have arisen as a result of higher coal and coke prices could be solved by application of recent technological advances.

Among recent commercial contracts concluded with German participation is a triangular deal providing for the supply of 50,000 tons of pyrites from Spain to Western Germany for the production of sulphuric acid. The acid will be exported to Austria which will, in turn, repay Spain by shipments of nitrogenous fertilisers from the fixation plant at Linz.

A trade agreement signed between Western Germany and Chile provides for the importation of various ores and metals, copper semis and saltpetre by Germany in return for shipments of dyes, other chemicals and engineering products.

Salt as a Fertiliser

continued from previous page

lines of the well-established lime-spreading services. This is not the only connection that might be traced between salt and lime, two liberally native materials of Britain. If we look back to the 19th century, we find records of considerable farm use of mixtures of lime and salt for soil application in the autumn or winter.

There is today ample evidence that both these materials are grossly under-used in home food production. To quote from a recent article in the Ministry of Agriculture's N.A.A.S. Quarterly Review (1950, 10, 89-91): 'Sodium has many definite functions to perform in agriculture, and although our knowledge of them is advancing, much more research is required if the fullest use is to be made of the large deposits in the form of salt that lie buried beneath the soil of England.'

Delayed Coking Improvements

Technical Problems and Costs

AS a unit process in refinery practice, delayed coking has experienced an unprecedented boom during the last two years. Improvements in operating technique and a shifting market for petroleum products have only now transformed this development of the early thirties into an important economic tool for petroleum refineries.

Greatest potential for delayed coking operations exists at sites which are sufficiently removed from the major fuel markets that their residual fuel oils cannot be economically shipped to compete effectively with natural gas. At such locations, every effort must be made to maximise the yield of petrol. Delayed coking, especially when operated in conjunction with catalytic cracking, is capable of improving petrol yields even over conventional viscosity breaking operation. At the same time a by-product coke can be recovered whose low-ash and low-volatility characteristics provide it with a ready premium market as electrode coke in the aluminium and allied industries.

In essence, delayed coking, like De Florez ultimate yield coking, carries cracking to heavy residues to its ultimate conclusion. Other liquid-phase thermal cracking processes aim for a residue which is still sufficiently fluid to be readily handled and which still has a sufficiently hydrogen/carbon ratio to prevent coking and consequent obstruction in the high-temperature zones of the pipe still. Delayed coking, on the other hand, carries the breakdown reactions of the feedstock to the point where all the unvaporised portion is solid coke.

Severe Handling Problems

This introduces severe handling problems and confines the process to semi-continuous operation to allow periodic removal of the petroleum coke from the system. Severe limitations are imposed on the design of the pipe still in which coke formation must be avoided to assure proper heat transfer and to minimise flow obstruction in the high temperature zone.

These two basic limitations set the concept of the delayed coking process. The feedstock is passed through a heating coil where its temperature is raised to 900-950°F. In the course of its passage through the coil, a portion of the oil is vaporised and breakdown reactions are initiated. Design efforts must be bent toward minimising cracking at this point. This can be accomplished by maintaining soaking time at the lowest feasible level. In practice this is achieved by rapid passage through a heating coil designed entirely for radiant heat transfer.

Sufficient Soaking Time

The heated charge leaving the furnace is fed to the bottom of one of a battery of two coke drums. Here, sufficient soaking time is available to permit completion of the desired cracking reactions. The unvaporised portion of the charge goes to coke which builds up gradually inside the coke drum. Vertical build-up in recent installations of this type is as high as 80-100 ft. The vaporised portion of the charge, along with the volatile products of the breakdown reactions, passes through the porous (50 per cent and more voids) coke bed and is taken overhead to a condenser and finally to a fractionating column.

In the course of fractionation, the drum overhead is split into light fractions, a gas oil cut which is suitable feedstock for catalytic cracking, and a heavy residual oil which may be recycled to the delayed coking process, if so desired.

Most commonly, the feedstock for delayed coking operations is topped crude which is preferably coked in a once-through operation. Less desirable are cracked feedstocks which will give lower petrol and gas oil yields and whose derivative gas oil is objectionable because of its highly refractory character in subsequent catalytic cracking operations.

Accordingly, such stocks are only employed for delayed coking where fuel oil must be internally disposed of at almost any cost.

The yield of gas oil increases rapidly with increasing API gravity of the feed, while the yields of petrol, coke, and gas decrease. Armistead cites the following typical yields to be expected in once-through coking from paraffinic topped crude of different gravities :

Feed °API	Gas Oil (900°E.P.) vol. %	Coke (wt.%)	Gas (wt.%)	Gasoline (400°EP.) vol. %
15	68.0	17.5	6.0	19.5
20	76.5	11.0	5.0	16.0

Illustrative of yields to be expected in recycle coking are the design data for a 420 ton/day delayed coking installation which

Pan-American Southern Corporation has recently taken on stream at its El Dorado, Ark., refinery. Here the feedstock is a 12.6° API residual oil derived from topping a mixture of 34° API Arkansas and North Louisiana crudes, and combined with cracked heavy oil yielded by the delayed coking unit itself. On a weight basis, the following distribution is anticipated :

Charge	100.0%
Gas, C_3 and lighter	5.1
Gasoline, 100 per cent C_4	16.1
Gas oil (900° cat. 90 per cent)	52.2
Coke	26.6

The characteristics of the coke depend primarily on the feedstock.

Thus, a light stock will tend to produce a harder and more compact coke with lowest volatile matter. A cracked feedstock will yield a coke similar to that derived from a crude of greater specific gravity. By proper blending of stocks, it thus becomes possible to modify coke characteristics to meet market specifications.

Design for good heat economy necessitates recovery of the heat values contained in the flue gases leaving the radiant section of the pipe still which is alone employed in the delayed coke cycle. A portion of this heat may be effectively utilised for the topping operation. The bulk of the residual heat is, however, usually recovered in waste heat boilers for the generation of steam.

The coke drums proper are in effect simple vertical cylindrical vessels with diameters ranging between 8-20 feet and a height of 50-100 feet. Construction is usually carbon steel with a high-chrome alloy liner in contact with the high-temperature bed of coke (average drum temperature ranges between 775-850°F.; operating pressure is below 50 p.s.i.). Filling time per drum has been reported between 6 and 40 hours. As soon as a drum has been filled to capacity, it is taken off stream and the charge is directed to the second coke drum in the battery.

An Expensive Operation

Coke removal from the off-stream drum is an expensive operation; as regards first investment as well as labour costs. Coke must be broken from the unit and removal is always effected from the bottom toward the top in order to permit ready discharge through the opened lower outlet of the drum. Early methods involved the suspension of a coiled steel cable inside the drum. At the end of the coke-filling period, the cable was withdrawn through the coke bed, thereby breaking up the charge. This method has fallen into disfavour because it introduces large amounts of objectionable wire into the product coke.

More recent methods involve drilling a vertical hole through the centre of the coke bed at the end of each run. Through this central hole a coke-breaker may be lowered. Mechanical arrangements, involving the use of swinging weights, are considered the least expensive means of crushing this coke *in situ*. However, the disadvantage of this method is the formation of large amounts of low-value coke breeze and dust.

Probably the favourite method in the installations of the past three years has been a hydraulic system in which a high-pressure vertical jet of water drills the initial centre hole (of approximately 18-in. diameter) through the coke bed. The coke is then broken out of the drum by horizontal high-pressure jets of water ejected by a hydraulic cutting assembly which is gradually lifted through the chamber.

Zirconium Production

THE production of zirconium on a commercial scale has recently been initiated by Murex Limited, Rainham, Essex. Previously only very limited supplies were available in England and even now full production has not yet been attained.

Sheets down to .005 in. in thickness, 6-7 in. in width and 2-3 ft. in length are now being made, and it is expected that sheets up to 12-15 in. in width will be available in the course of the next few months. Rods down to 2 mm. diameter can be supplied and drawn zirconium wire may also be available shortly.

Zirconium has excellent resistance to corrosion. Hydrochloric acid and fused alkalis have practically no effect on this metal, while its resistance to attack by nitric, phosphoric and sulphuric acids is only slightly less than in the case of tantalum. This property renders it very suitable for use in chemical plant where corrosion resistance is required. It is also employed in surgery, for the same reason, and because of its further convenient property of attaching itself permanently to the surrounding flesh.

Zirconium has exceptionally good 'getter' properties which will tend to make its use in electronics widespread. It is used in grid emission inhibitors and can, in many cases, replace tantalum or molybdenum.

British Standards Institution

Urgent Need for Expansion

THE importance of standard specifications to the chemical industry for sampling and testing laboratory apparatus and chemical plant lends particular interest to the report of the Cunliffe Committee on the organisation and constitution of the British Standards Institution published this week (HMSO 1s.).

Fifty years ago the Institution of Civil Engineers appointed a committee for the standardisation of steel sections such as girders. From this has developed the British Standards Institution of to-day, working through some 2,000 different technical committees, and responsible for about 1,500 general standards, over 200 special standards, and some 30 codes of building practice. Even since 1939 the number of general standards has almost doubled.

Current annual expenditure is roughly £220,000—less than one-quarter of the estimated saving from the work of that first 1901 committee on steel sections.

It is estimated, however, that with further advances in standardisation this expenditure will double over the next few years : and it was in view of this that, in June, 1949, the President of the Board of Trade appointed a committee under the chairmanship of the Hon. Geoffrey Cunliffe to consider the Institution's organisation and constitution.

The report refers to the recommendations of the 1949 Committee under Sir Ernest Lemon on standardisation in the engineering industry; to the survey of the group which went in 1949 from the Anglo-American Council on Productivity to study the policy of simplification in the U.S.A.; to the setting up by the OEEC of an Advisory Group for Increasing Productivity through Standardisation; and to moves in several industries for certification marking schemes dependent on suitable standards.

Increasingly Recognised

The economic importance of standardisation is being more and more recognised by industry and the committee regarded it as self-evident that an expansion of the British Standards Institution was urgently necessary.

When a request for a standard has been approved the Industry Standards Committee, in consultation with the BSI staff, name the organisations which should be represented, draw up terms of reference, and authorise the BSI staff to invite nominations to the new Technical Committee.

Many Technical Committees include nominees of the appropriate industrial research organisations or Government research stations. These members are able to present an independent scientific view, to make suggestions for necessary research, and possibly to help in getting this done. They are usually of high quality and the only unfavourable criticism, if it can be so termed, is that they sometimes press for a degree of perfection which in the practical conditions of industry is not yet attainable. The committee considered, however, that the practical viewpoint was generally represented strongly enough to balance any over-theoretical view.

Process a Long One

The process of preparing a specification is naturally a long one, and subject to many risks which may delay or even prevent altogether the production of the completed document. The average time elapsing after the decision to initiate action on 50 new specifications published in 1949 was approximately three years, made up as follows :—

Two years from decision to initiate action to circulation of draft for comment;

Six months from circulation of draft for comment to approval of final draft;

Six months from approval of draft to publication. (Delays in publication were abnormal during this period and have since improved.)

In 24 cases (where the time was unusually long) the following were the principal reasons :—

Need for research or testing work (6); large volume of comment, some received late (2); staffing difficulties (6); long discussions on committee (1); disagreements on committee (3); miscellaneous—need to check calculations, discoveries of technical errors, co-ordination with other specifications, etc. (6). The shortest time taken was 13 months and the average number of meetings held was 9.

It would be wrong to assume that the time taken is so long as to arouse any general dissatisfaction in industry.

The importance of keeping standards up-to-date by revision had been emphasised

from a number of memoranda, and the BSI was well aware of the importance of this matter.

At present revisions are quite frequent, but are not carried out as a matter of routine. With the rapid advances being made in technical developments in many industries, it is most desirable that standards should be kept up to date so as to continue to represent the best current practice. The Lemon Committee drew attention to this point and recommended that standards should be reviewed periodically.

After considering several suggestions made in evidence, it was recommended that all standards should be reviewed as a matter of routine every five years. For this purpose, Industry Standards Committees should state annually which standards were to be reviewed in the coming year. This recommendation does not, of course, preclude revision at other times if the need arises.

Government Contribution

The Institution has received a contribution from the Government every year (except 1909) since 1904. The contribution at present stands at £90,000. A formula arrived at in 1943 for relating Government to industrial contributions is already out of date, since it would produce considerably less than is needed. For the year 1951/2 a minimum Government contribution of £90,000 was recommended and thereafter a contribution equal to the income from industrial subscriptions, subject to a maximum of £150,000.

Such a contribution was felt to be justified on two grounds: first, the Government is a large purchaser of goods of all kinds; secondly, it represents the public as consumers of goods which, in the absence of standards, might be dearer or less serviceable. At the same time, too large a subscription would prejudice the Institution's autonomy, and the Committee thought it unwise to suggest a Government contribution in excess of that subscribed by industry.

The Committee found that the constitution and organisation of BSI was well adapted for carrying out its present work and the increased work which may be expected to fall upon it. The BSI should remain under the control of its own General Council and retain its present status as a body incorporated by Royal Charter.

The British Standards Institution has expressed general acceptance of the recommendations of the committee.

Supplies in Sterling Area

A NEW agreement between the United Kingdom Government and two of the main U.S. oil companies was announced by Mr. Alfred Robens, Parliamentary Secretary to the Ministry of Fuel and Power, in the House of Commons on 12 February.

The main provisions were the abandonment of the policy of substituting British-controlled oil for American-controlled oil in the sterling area and the simultaneous removal of discriminatory restrictions on American oil companies trading in the sterling area.

An agreement was made with the Standard Vacuum Oil Company in April last year, and another with the California Texas Oil Company in July. In May, agreements were made with the Standard Oil Company (New Jersey), and with the Socony Vacuum Oil Company, on the disposal of their share of Iraq oil. The Government had now made further agreements with these two companies which settled all the other issues outstanding.

Dollar savings are expected to increase as the United States companies progressively reduce the dollar content of their oil to that of the British companies. This is reckoned to be about 30 per cent, whereas that of the United States companies was something like 75 to 80 per cent in 1949.

The United States figure has come down sharply since then—at the moment that of the Anglo-American Oil Company is about 40 per cent. It is estimated that by 1954, this country should be getting a third more oil than in 1949 at a dollar cost of a quarter less.

Among the immediate steps being taken by the Anglo-American Oil Company, a subsidiary of the Standard Oil Company (New Jersey), to implement the new agreement were the purchase of substantial amounts of oil from sterling sources for the parent company's sterling area trade.

Another important achievement was the advancement of the completion date of the new refinery at Fawley, Hampshire. The plant is now likely to begin production in August instead of in January, 1952.

Dyestuff Plant for Israel

Plans for the construction of a dyestuff plant to be built at Ludd, Israel, in the near future, were recently reported in the Swiss Press. Some 80 per cent of the output is expected to be exported.

Fertiliser Manufacture

The Nitric Acid Treatment of Phosphate Rock

THE use of nitric rather than sulphuric acid in the production of phosphate and nitrogen fertilisers from phosphate rock was the subject of a paper by Dr. M. H. R J. Plusjè read to the Fertiliser Society on 15 February.

Nitric acid, said Dr. Plusjè has several economic advantages over sulphuric. One, of course, is the fact that sulphuric acid demands hard-currency raw materials for its manufacture. Another, of interest to the phosphate manufacturers, is that the nitric acid used to dissolve the ore can subsequently be converted into a valuable nitrogen fertiliser, thereby lowering the production costs of the phosphate; and the third, of great importance to nitrogen-fertiliser manufacturers, is that dicalcium phosphate has been found to be an ideal inert filler for ammonium nitrate, and the nitric acid used to make the phosphate can easily be neutralised with ammonia *in situ* to produce this. Dicalcium phosphate not only stabilises ammonium nitrate better than calcium carbonate, but a mixture of 40 parts phosphate to 60 nitrate contains 20 per cent available P_2O_5 and 20 per cent nitrogen, thus doubling the plant food content and halving the cost.

By a study of the phase-equilibria concerned, Dr. Plusjè presents us with the complete reaction cycle for producing both phosphate and nitrogen fertilisers.

On adding phosphate rock to 50 per cent nitric acid, the sequence in which phases occur (depending of course on temperature) is: clear solution; solution and one solid phase ($Ca(NO_3)_2$, $CaH_4(PO_4)_2$, or $Ca_2H_2(PO_4)_2$; solution and three solid phases; and mixtures of four solid salts. The precipitation and isolation of the requisite single solid phase is therefore achieved by temperature variation of the nitric acid/phosphate rock system.

Precipitation

Monocalcium phosphate is obtained in this way by adding phosphate rock to the acid until all the monocalcium salt has precipitated and the solution is just saturated with respect to the next solid phase to precipitate—dicalcium phosphate—and then removing the solid. The solution now contains an excess of calcium nitrate which would increase if more nitric acid and phosphate rock were added and the process repeated. To remove the nitrate, therefore, the solution is cooled from 100°C. to 5°C., when the nitrate precipitates, and the filtrate is then ready for a repetition of the process. The cycle is shown in Fig. 1, the total conversion being represented by the reaction equation: $4CaO.P_2O_5 + 6HNO_3 + 4H_2O \rightarrow CaH_4(PO_4)_2.H_2O + 3Ca(NO_3)_2.4H_2O$.

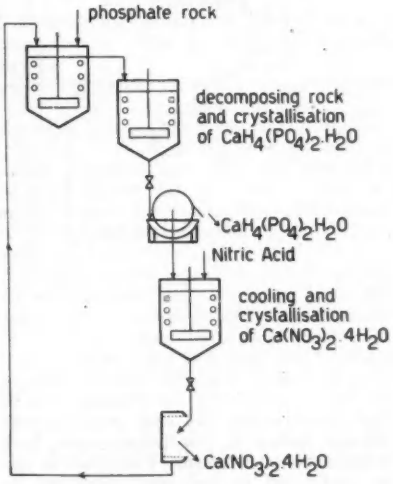


Figure 1

Dicalcium phosphate, said Dr. Plusjè, is a fertiliser almost as effective as the monocalcium salt, but more in favour on the continent than it is here because the citrate-solubility test is officially allowed there as well as the water-solubility. It is obtained simply by neutralising the nitric acid solution of phosphate rock with lime according to the equation:

$$H_3PO_4 + 2Ca(NO_3)_2 + CaO \rightarrow CaHPO_4 + 2Ca(NO_3)_2 + H_2O.$$

An increase in yield is obtained, however, without lime, by cyclising the process as before. The composition and temperature are varied so that the solution is saturated with respect to the dicalcium phosphate at

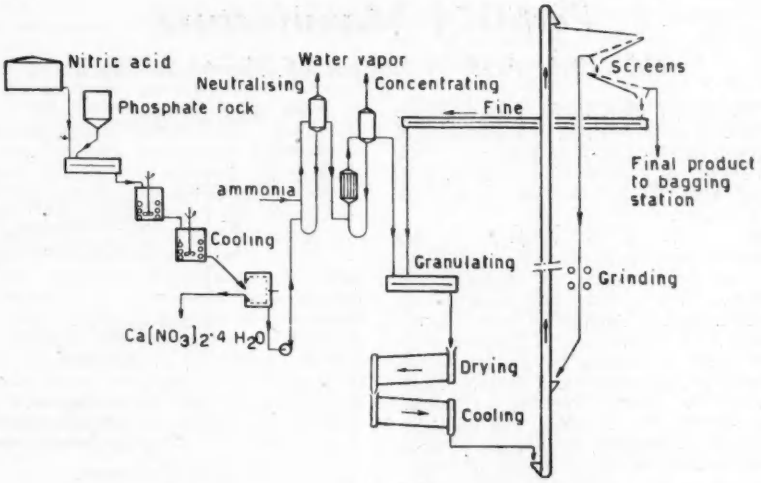


Figure 2

high temperatures, and with respect to the calcium nitrate at low temperatures, both being removed in turn. The reaction can be performed in the same apparatus as before.

The compound nitrogen/phosphate fertiliser mentioned above that gives dicalcium phosphate its main advantage over the monocalcium salt, is prepared by dissolving the phosphate rock in acid and immediately crystallising out part of the calcium nitrate formed. This is done to lower the ratio of CaO/P_2O_5 to 2 (as in dicalcium phosphate), instead of 4 (as in phosphate rock). The solution then contains calcium nitrate and free phosphoric acid, and this is neutralised with ammonia so that a suspension of solid dicalcium phosphate in a concentrated solution of ammonium nitrate is obtained. The process is completed by concentrating the solution, granulating and drying. The whole process is shown diagrammatically in Fig. 2.

Dr. Plusjè brought his paper to a close by saying that the subject of the treatment of phosphate rock with nitric acid was by no means exhausted by his paper. In the future, he hoped, the use of phase-equilibria in this reaction, as shown, would lead to the development of yet more processes of value to fertilisation.

Mond Nickel Fellowships: Applications Invited

APPLICATIONS are invited for the award of Mond Nickel Fellowships for 1951. The main objects of these Fellowships is to enable selected applicants of British nationality and educated to university degree or equivalent standard to obtain additional training and wider experience in industrial establishments, at home or abroad. If they are subsequently employed in executive or administrative positions in the British metallurgical industries, it is hoped that as a result of this training they will be better qualified to appreciate the technological significance of research and to apply its results.

There are no age limits though awards will seldom be made to persons over 35 years of age. Each Fellowship will occupy one full working year. It is hoped to award five Fellowships a year with an average value of £750 each.

Applicants will be required to define the programme of training in respect of which they are applying for an award, as well as particulars of their education, qualifications and previous career. Full particulars and forms of application can be obtained from the secretary, Mond Nickel Fellowships Committee. Completed forms must be received not later than 1 June, 1951.

Thickness Measurement of Wet Films

New German Apparatus Described

ACCURATE measurement of volumetric changes in films during drying is often necessary in the paint and allied industries, and although a good deal has been written on gravimetric changes in this connection, little has apparently been done in regard to volume changes.

Some well-known types of apparatus and a new German film-meter, designed by himself, were recently described by Dr. Werner Garmsen (*Deutsche Farben-Zeit*, 1951 *5* (1), 11-14, Jan.)

The first instruments dealt with by the doctor were those of the Gardner Laboratories in the U.S.A., and the Typ Drage, made by Firma Dr. A. G. Epprecht in Zurich. Both these are based on the same principle which employs a small eccentrically disposed disc running between two larger graduated discs. It is held between the thumb and forefinger and rolled over the surface so that the eccentric is wetted and indicates thickness.

An apparatus designed by Pfund made by Willig and Ebert of Düsseldorf (see also *Fochkunde für Lacklaboranten* of Otto Merz, 1950, pub. Wissenschaft Verlagsges, Stuttgart), consisted of two cylinders of which the inner is held by three springs and provided underneath with a convex lens. When this device is stood on the wet film and the inner cylinder pressed downwards a spot of paint attaches to the lens the size of which indicates thickness. Dr. Garmsen carried out numerous tests with this film-meter, for paints and varnishes dry and wet.

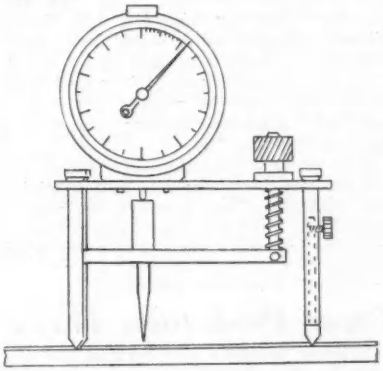
Wet films ranged from 76 to 127 μ in thickness and the dry from 18 to 44 μ; the latter being somewhat lower than would be expected from the thickness of the wet film and known solids content. Tests were also made with some resin varnishes and large differences were found between results given by the Pfund instrument and those calculated. The solids content had been accurately determined beforehand.

The Pfund lens was spherical, of radius calculated from segment of 33.8 cm. The curve for varying values of 'a' (width or chord of segment) could be easily drawn. If r represented radius and h height of segment then it could be readily shown that

$$h = \frac{a^2}{8r}$$

in using the relation, account must be taken of the effect of surface tension, otherwise serious errors occurred. The author described some tests with linseed oil (with and without pigment) using this apparatus and the values found (measured) were 2½-4 times those calculated. Errors were of the order of 150-300 per cent.

It was concluded that this simple apparatus was not sufficiently accurate. Much the same applied to the Gardner and Epprecht devices, the results being falsified by surface tension. Dr. Garmsen accordingly designed a new film-meter which is now being manufactured by Firma Viehoff in Münster.



The instrument shown above comprises a graduated dial with pointer (Messuhr) mounted on a three-point support or table in such manner that the movable probe or feeler may be moved up and down by a lever screw and spring combination. Below the probe is a pointer which, taking a measurement, is raised 500 μ above the plane of the three supporting feet.

When the pointer is slowly lowered, at the moment when it touches the wet paint or varnish surface there forms around it a clear and sharply defined ring at its point

caused by the surface tension, which in this case, according to the author, has no effect on the measurements. The ring formation merely serves as a precise indication of the time and place of contact. If, owing to surface drying, the ring is not clearly seen the point of contact can be readily observed by slanting light and reflection.

Next the pointer is lowered further until it rests on the solid under surface or base material and the end position on the dial can be read, the whole operation only taking a few seconds. Some test results were recorded testifying to the accuracy of the readings when compared both among themselves and with those calculated. Variations were, of course, liable to occur from place to place of the surface as neither the basic material nor the coating are absolutely flat or smooth. The narrow limits within which the measurements were made and the possibility of strictly defining these beforehand were evident advantages.

In the case of a poor flow and furrowed paint surface it is also possible to determine fine differences between ridge tips and furrows. This was tried out with linseed oil and lithopone which would be expected to have poor to mediocre flowing properties. Thickness measurements (10) ranged from 30 to 100 μ and the average was 62.3 μ, and the difference between ridges and furrows was thus 70μ.

Wide usefulness is claimed for this simple but accurate device not only in determining film thickness of wet coatings, but also in ascertaining covering power and amounts of paint or varnish required for a given surface.

Paper Production Threat

Sulphur Shortage Has Serious Effect

CANADIAN pulp and paper producers are facing the possibility that their production will be cut back by as much as 15 per cent in the coming year due to a drop in the supplies of readily available sulphur, a top papermaking expert told the 37th annual meeting of the Canadian Pulp and Paper Association on 25 January.

The possibility also loomed that if no new and 'easily mined' sources of sulphur are found in the near future, or if no new methods of conserving or recovering sulphur are found, this cut back may grow progressively worse. The one other possibility is that more expensive means of mining sulphur will have to be used than at present with a consequent jump in the already record-high prices of papers.

Dr. W. H. Swanson, of Neenah, Wis., brought the bad news into the open when questioned about a convention rumour that one of the companies, with which he is associated, had found a way of recovering up to 40 per cent of the precious sulphur. This material is essential to paper making.

Dr. Swanson said he was sorry that he had no such formula to offer. He added that one firm at Long View, N.Y., had evolved a method of saving sulphur—'but this development has not been exploited because the company is not convinced that it is economically sound.'

He knew that another firm, in Sweden, was also working towards the same goal, but so far as he could say, no immediately practicable method was as yet in general use.

Dr. Swanson estimated that in '15 to 30 years' the supply of sulphur from Texas Gulf would be exhausted and other sources would have to be found.

This year sulphur supplies have been cut 15 per cent, he said. This could mean that mills which already are using sulphur at peak capacity, and which have no backlog of supplies, will have to trim production.

Plants which are not using sulphur at peak efficiency will be offered the formula evolved by the plants with which Dr. Swanson is connected.

Through this formula, use of sulphur can be cut by about 40 per cent—but as this type of production is already well known it is not likely that it will mean reduction in the use of sulphur by many mills, Dr. Swanson said.

He thought it was this process which 'gave rise to the rumours that we had a plan for recovering 40 per cent of all sulphur used. I wish it were true.'

Dr. Swanson said he did not want anyone to think he was painting too black a picture. There were other sources of sulphur—there were deposits in Italy and sulphur can be made from iron pyrites. But both these substitutes mean sulphur would become much more expensive if they were utilised.

Research laboratories of the pulp and paper industry were working hard on this problem. It could be that they would come upon a paper-making process which would use even less sulphur or which would enable the plants to recover and re-use sulphur, he explained.

Electrical Problems in Chemical Works

Overcoming Hazards of Corrosion and Explosion

THE problem of designing an electrical installation for use in a chemical factory which may have corrosion or explosive hazards is not new, nor are these hazards confined to chemical works; but it is probably true that in no other industry are there to be found together in one plant such a variety of destructive agents nor such severe ones.

Electricity has been used in chemical works for more than 60 years. During this period a considerable fund of experience concerning effective means of dealing with these dangers has been accumulated. Curiously enough this has not led to complete unanimity regarding the best materials or methods, and perhaps this is as well for not only are there often several good ways of doing a job, but the holding of diverse opinions by the engineers concerned tends to promote friendly rivalry and alertness towards new ideas and equipment.

Some of the general factors affecting design in large chemical factories were discussed by Mr. D. B. Hogg, of I.C.I's Wilton Works, in a paper delivered to the North Western branch of the Institution of Electrical Engineers last Monday.

The following are some of the points brought out by Mr. Hogg:—

There is an essential difference between the problems of the designer of the mechanical equipment for chemical plants and those of his electrical colleague. The former is always meeting new processes which require higher temperatures and pressures and new techniques, and he frequently has to install equipment made from new materials or use methods which have been tried out only in the laboratory or pilot plant and which frequently are being incorporated in full-scale plant for the first time.

Must Choose Most Suitable

The electrical engineer on the other hand, while he must take every advantage of research and experiment, is mainly concerned with choosing, from a range of well-known and long-used materials and methods, those best suited to particular conditions. The cost of the electrical equipment for the distribution system, power wiring and lighting in a chemical factory seldom exceeds 5-7 per cent of the whole, and the use of new and untried apparatus may jeopardise much plant and lead to costly stoppages.

The Economic Factor

A designer of electrical installations in large chemical factories has to consider, beside the usual problem 'What methods and materials will prove the most economical in the long run?' four other major factors which are not always present in other industries; these are:

(*a*) The area is large and distances between and within buildings may be great. Some chemical plants cover hundreds of acres, and it is economically necessary, as well as technically desirable, to distribute power at high voltage.

(*b*) In most chemical factories an appreciable portion is working by day only, but it is probable that the greater part is on continuous shift. The process may be on the batch principle or it may be itself continuous, but in both cases the electrical installation and equipment must be capable of running for months or years on end without maintenance other than lubrication and surface cleaning. There are neither weekends nor an annual holiday in which to carry out repairs. 'Planned maintenance' systems are usual, and the electrical layout must be arranged to ensure that the process plants can be closed down in sequence, with safety to the operators and to the remainder of the process.

(*c*) The maximum demand varies from factory to factory and probably depends more on the nature of the process than on the extent of the premises; demands up to 70 MVA have been experienced in some works. A wide range of prospective fault currents will be found, and 750 MVA at 11 kV is not unknown. In general, the load factor tends to be high, round about 80 per cent or better, and in the author's experience the variation between night and day is in the range 3-5 per cent and between summer and winter 5-10 per cent. This steady load means a sensibly constant voltage and therefore permits a higher transformer reactance than usual in public supply, and a reduction in fault current, without damage to lamps.

(*d*) Additions and alterations to the plant and electrical layouts are frequently required and may be extensive.

These are one result of the continuous research which is carried out on a very large scale to find improved methods of manufacture, new products and fresh markets. Factories in many other industries were expected to run for a generation or so with only minor changes; the chemical industry sometimes suffers appreciable alterations and even major redesign as soon as production is running smoothly and even during construction periods.

Must Provide Space Capacity

This requires the electrical designer to provide spare capacity in the distribution system and spare ways in fuse boards in the plants, avoiding on the one hand the Scylla of an extravagant initial layout which may never be used as planned and, on the other, the Charybdis of so economical an installation that the addition of a few motors requires an expensive enlargement of the system.

There are many parts of a chemical factory where conditions are as good as anywhere else in industry and in these the electrical installation follows normal good practice using high-class materials.

Good modern practice is being followed. Mercury-discharge lighting has been in use in plant buildings for some years and fluorescent lamps are being installed. The intensity of lighting in many chemical plants need not be high because the materials being processed are enclosed in pipes and vessels and are not seen until manufacture is complete. No amount of general lighting more than that required for statutory and comfort purposes can have any effect on improving quality or output.

For simplicity it is usual to class conditions as—(*a*) mildly corrosive, that is ordinary chemical works conditions, humid, dusty and with small amount of fume; and (*b*) strongly corrosive, as found in plants processing concentrated acids and alkalis where leaks cannot be eliminated. All practicable steps are, of course, taken to prevent spillage and leaks damaging the equipment.

Generally, installations in mildly corrosive conditions are similar to those in clean situations because the methods and materials used in the latter follow good practice, and it is neither economical nor safe to stock several qualities of common items lest the poorer ones be installed inadvertently or in emergency where only the best will last.

Typical examples of strongly corrosive conditions are plants using or making sulphuric, nitric and hydrofluoric acids, but there are many more including those in which the caustic alkalis are present. As much of the electrical apparatus as is practicable is housed in separate buildings or compartments free from corrosion, and special precautions are taken to protect the rest from leaks, drips and fume.

There is as yet no comprehensive set of Statutory Regulations for explosive hazard conditions in industrial premises comparable with those governing the installation and use of electricity in coal mines. One large firm of chemical manufacturers divides probable conditions into three degrees of hazard (excluding non-hazardous situations):

Class B. Where inflammable or explosive gas, vapour, dust or volatile liquid, although processed, handled or stored in the area, is so well under conditions of control that its liability to constitute an explosion hazard in contact with electrical apparatus may be considered negligible.

Class C. Where inflammable or explosive gas, vapour, dust or volatile liquid is processed, handled or stored in the area under conditions of control such that its liability to constitute an explosion hazard in contact with electrical apparatus is not negligible and for which certified apparatus is available.

Class D. Where the above materials are continuously present in explosive concentration, or for which no certified electrical apparatus is available.

Avoiding Fire Hazards

In Class B areas the guiding principle is that apparatus in which sparking or heating may take place in normal operation shall be so constructed or protected as not to give rise to a hazard if temporarily surrounded by an explosive atmosphere.

In Class C conditions all electrical apparatus installed in the hazardous area must be certified flameproof or safe for the group to which the cause of hazard belongs.

In Class D areas no electrical apparatus should be installed in the danger area. Any mechanism required to control the outside electrical apparatus which itself must be within the danger area must be of the non-electrical variety. Lighting should be projected from sources outside the area.

Textile Dyers' Dinner

Chairman of I.C.I. Chief Guest

IN proposing the toast of 'The Guests' at the Confederation of Textile Dyers' and Finishers' first Dinner and Dance at the Midland Hotel, Manchester, on 16 February, Mr. James Ewing, chairman of the B.D.A. Ltd., in welcoming Mr. John Rogers, chairman of the I.C.I., Ltd., as chief guest, said his was a name to conjure with in the business world as a worthy successor to his distinguished predecessor. In dyestuffs, the progress of the I.C.I. had been spectacular. It had never used the big stick and its price policy had been tempered with full consideration for the consumer. It would be a retrograde step if, as had been hinted, the Government scheduled it for nationalisation.

Referring to Sir Raymond Streat, he said the Cotton Board might with advantage extend its functions to become a liaison with all Government Departments—a form of decentralisation which would be a happy relief from the excessive centralisation so dear to the hearts of many of our idealists in the Government. Mr. Ewing said he would like to see the Cotton Board functioning as an epitome of all the Government departments with which industry could keep locally in touch, so that we could get a more intimate contact in the operation of the evidenty unavoidable Government regulations, because a decentralised local department is in a better position to realise what industry requires than are harassed civil servants in Whitehall.

Board Has Great Influence

Mr. W. Crossley, chairman of the Confederation, replying to the toast of the Industry of Textile Dyeing and Finishing made by Sir Raymond Streat, said that the Cotton Board were not eligible for membership because they 'dye not neither do they spin,' yet Sir Raymond had a wonderful influence over their policy and activities. He had, for example, inculcated the spirit of price moderation into their minds to such an extent that occasionally they felt ashamed of making a profit at all. 'You all know, too,' he said, 'the case of the dyer who left £100,000. He owed this wealth, not only to his successful battles with the Cotton Board, but to thrift, honesty, integrity, hard work, skill, determination and, also incidentally, to the fact that an uncle in Australia died and left him £98,000.

From this, said Mr. Crossley, they would gather that while they might not have been born honest, or even achieved honesty, they had certainly had honesty thrust upon them, and this had now become so engrained in their characters, that they sometimes even gave their customer darker shades than they wanted. Rather ungratefully, these were called 'off-shades.'

Other guests included Dr. C. J. T. Cronshaw, Sir Cuthbert Clegg, Mr. A. J. C. Walters, Mr. H. Haygarth Jackson, and Mr. P. N. Hoyle.

Sulphuric Acid from Anhydrite

PRODUCTION of sulphuric acid by other means than from natural sulphur has been under consideration for some time, but the need for some more definite action has been forced on the chemical industry by the world-wide shortage of this material.

Plans are expected to be announced shortly by Imperial Chemical Industries, Ltd., for a new chemical plant to manufacture sulphuric acid from anhydrite, a mineral which exists in several parts of Britain.

A scheme is said to be under review whereby anhydrite plants might be constructed on the basis that the acid users might provide the finance, and I.C.I. the technical assistance. A capacity of about 150,000 tons of acid has been suggested for the first plant which would cost about £3,500,000 to build. It would make a useful contribution to the country's sulphuric acid supplies, which it is anticipated will fall from 1,800,000 tons a year to less than 1,500,000 tons as a result of the reduction of imports of elemental sulphur from the U.S.A.

Two alternative sites have been proposed for the new plant. One is on Merseyside close to many large industries which need quantities of sulphuric acid, such as the manufacture of rayon. The other is at Billingham-on-Tees, County Durham, where I.C.I. is already mining nearly 93,000 tons of anhydrite a year. The process there yields about one ton of acid and another ton of cement clinker for every 1¼ tons of anhydrite.

Other deposits of anhydrite exist at Carlisle and Barrow-in-Furness.

Two other concerns reported to be jointly interested in the project are Courtaulds, Ltd., for whom I.C.I. is already producing nylon polymer, and Fison's, the fertiliser manufacturers.

Raw Materials Shortages

Questions Asked in Parliament

MEMBERS of Parliament asked the President of the Board of Trade for details about present raw materials shortages during question time on 15 February.

Colonel Crosthwaite-Eyre asked what amounts of sulphur the Board of Trade hoped to import into this country in 1951; and of this amount, how much would come from dollar sources.

Mr. H. Wilson: 'I am unable to estimate our imports of sulphur in 1951 as this material is almost entirely drawn from the United States where it is under export allocation. No allocation has yet been announced beyond that for the first quarter. Efforts are being made to obtain supplies from other sources, but so far as can be seen, the amounts are likely to be very small.'

Fair Distribution Promised

Colonel Crosthwaite-Eyre asked what arrangements had been made to ensure that sulphur stocks, or sulphur imported into this country in 1951, were to be fairly distributed to industry; and whether any priority list for the distribution of these supplies had been considered.

Mr. Wilson: 'Arrangements are being made to ensure that our supplies of sulphur are distributed to industries in this country in the best interests of the national economy.'

Mr. Linstead asked whether Mr. Wilson was aware of the shortage of white pigments containing titanium, zinc, lead and antimony; and what steps he was taking to improve supplies.

Mr. Wilson: 'I am aware that the production of titanium oxide and zinc oxide has fallen owing to the shortages of sulphuric acid and zinc respectively. The supply of these white pigments must remain difficult until our imports of zinc and sulphur improve, and we are continuing our efforts to obtain additional supplies of these materials. The shortage of white lead and antimony oxide is not so serious and results from increased pressure on supplies following the shortage of the other pigments, but steps are being taken to increase production.'

From 1 March next the use of zinc and copper in the manufacture of some articles of silverware, but not of cutlery, will be prohibited.

Fertiliser Production Survey

A LARGE increase in output and increased expenditure on plant and machinery are revealed in the preliminary report (No. 129) on the Fertiliser, Disinfectant, Insecticide and Allied Trades prepared for the Census of Production for 1948.

Government Establishments Included

The report, published in the current issue of the *Board of Trade Journal*, relates to establishments engaged wholly or mainly in the manufacture of artificial manures, fertilisers, insecticides, sheep and cattle dips and weed killers, and which employed more than ten persons on the average during the year, including two Government establishments in 1948.

It is estimated that about 98 per cent of the total net output of these establishments for 1948 is covered by the returns which have been compiled for inclusion in this report. This trade corresponds to minimum list heading 31 (2) in the Standard Industrial Classification.

Establishments in this trade in Northern Ireland are excluded in 1948. Owing to the risk of disclosure of information relating to individual firms, separate particulars of the output in Northern Ireland were not published for 1935.

The general summary shows the number of establishments as 169 in 1948 compared with 123 in 1935. Net output (in £'000) was 10,511 in Great Britain only in 1948, compared with 2,324 in 1937 and 2,136 in 1935 for the United Kingdom.

Costs of materials, fuel and electricity used in 1948 were valued (in £'000) at 20,743 (1948); 3,807 (1937); 3,225 (1935). Stocks of finished products and works in progress at the beginning of 1948 were vaued at £1,516,000 and £1,796,000 at the end of the year.

Capital Expenditure

Capital expenditure in 1948 showed that £543,000 worth of new and £22,000 worth of second-hand plant and machinery was acquired while £14,000 worth was disposed of. The cost of new buildings (including extensions, etc.), acquired during the year amounted to £143,000.

Total numbers employed by private firms in 1948 were 13,696, plus 25 working proprietors in Great Britain only.

The Chemist's Bookshelf

STEEL CASTINGS HANDBOOK, 1950 Edition. Edited by Charles W. Briggs and published by Steel Founders' Society of America, Cleveland, 15, Ohio. Pp. 511. $4.

This outstanding book, the first edition of which appeared in 1941, gives most comprehensive information on types of castings, specifications, design problems, applications, properties of cast steel, products made, processes and historical background. Divided into XVI systematically arranged chapters it serves as a standard reference handbook to engineers, designers, draughtsmen, students and others active in the metal working field, and it also appeals to chemical engineers as it gives the chemical compositions of standard steels and definitions of foundry terms. Detailed attention is given to the manufacturing process, with thorough sections dealing with pattern equipment, melting practice, moulding and core-making, finishing operations, inspection and heat treating facilities and operations. Also there are chapters on variables affecting the mechanical properties of steel castings according to carbon contents and alloying elements, on heat and corrosion-resistant alloys, on austenitic manganese cast steel and physical values pertaining to cast steel. Another chapter discusses at length cast steel under repeated stress, hardness, wear resistance, machinability, corrosion-resistance, heat-resistance, weldability, etc. The volume is copiously illustrated, carrying 440 photographs and sketches pertinent to text, includes 120 tables incorporating essential data, and all material is closely indexed and completed with references to books and periodicals.—F.N.

BAU UND BETRIEB CHEMISCHES FABRIKEN. (Building and Operation of Chemical Factories). By Dr. Otto Auspitzer, Springer-Verlag, Vienna, 1950. Pp. 80, Figs. 8.

This little book is rather difficult to classify. In colloquial comment, one might say that an old-timer is passing on a few wrinkles to the younger men. His sub-title is 'experiences and reminiscences,' but the chapter lay-out is that of a text-book and not a biography. Typical chapter-headings for instance are the site, the buildings, services, research, labour questions, and so on. So like a text-book, in fact, is the first impression, that the author feels it necessary to disclaim in the foreword any intention of writing one. And in fact his text confirms this. One might call it systematised reminiscence written in almost talkative, friendly style. The intended reader is the working chemist rather than the student.

Is he likely to be helped ?

The answer is probably a qualified affirmative. There is value in recalling the past and its mistakes but one can also be misled by it. New materials and processes may be overlooked in thinking over detailed ways of overcoming the defects of the old. Yet it is useful to know how one chemical works manager solved his problems.

So if you read German freely, are not irritated by the use of a bold face used as a body type and have an hour or two to spare, you may like to read through this slim volume.—I.B.

SCIENCE NEWS—19. Edited by J. L. Crammer. 1951. Penguin Books, Harmondsworth, Middlesex. 1s. 6d.

The latest addition to this series once again presents a number of interesting articles on a wide field of scientific matters, with 27 well-reproduced illustrations. Under the title 'Elusive Chemicals,' George Porter, demonstrator in physical chemistry at Cambridge University, deals with the history and importance of free radicals and their application to industrial processes. Controlled corrosion by means of galvanic protection is described by F. A. Fox, deputy technical manager of H. J. Enthoven & Sons, Ltd.

The revolutionary transformation of ideas of the physical universe in the past half-century are reviewed by Professor Max Born, F.R.S., while other subjects range from Astronomy To-day ; Hormones and Carbohydrate Metabolism ; and Studying Plants with X-rays to Guidance Devices for the Blind.–J.Y.

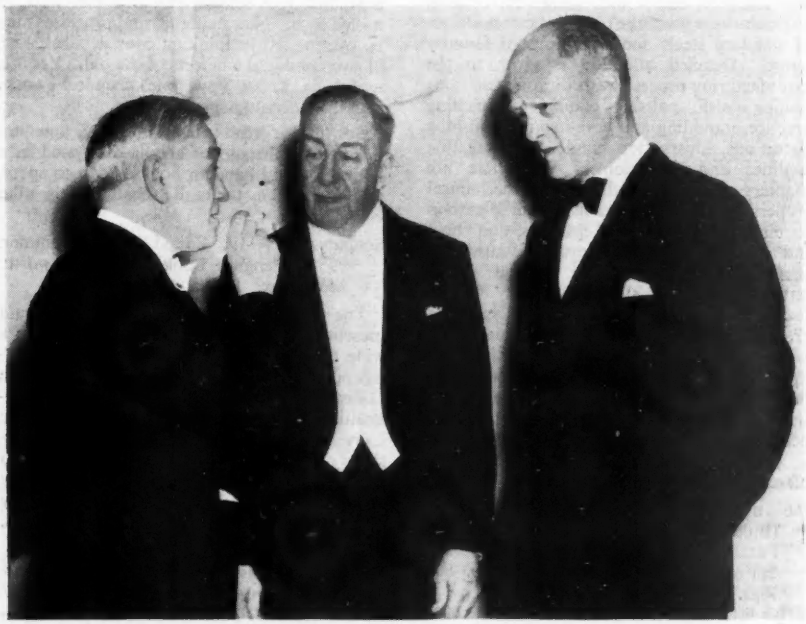
· PERSONAL ·

MR. A. R. LAWRENCE, export representative of Messrs. A. Boake, Roberts & Co., Ltd., is at present on his regular trip to the Mediterranean countries and the Levant. He has been out there since the end of January and is visiting among other countries, Egypt, Cyrenaica, Tripolitania, Malta, Tunisia, Algeria, Morocco and Gibraltar.

The Hercules Powder Company of Delaware announce that MR. HARRY E. HARTZELL, operating assistant for their Cellulose Products Department, has been appointed to supervise the production activities of the company's operations in Britain.

MR. S. C. TYRRELL, F.W.C.A., F.I.I.A., local board director and chief accountant of Newton Chambers & Co., Limited, has returned from a nine-weeks' tour of S. Africa and the Rhodesias. His address to the Sheffield Centre of the Institute of Industrial Administration on 13 February, covered his impressions of S. Africa's industries.

MR. P. I. C. BOVILL, B.Sc., director of the local board and general manager of the chemical works of Newton Chambers & Co., Ltd. has been appointed chairman of the Sheffield Centre of the Institution of Industrial Administration.



Three distinguished guests at the first dinner and dance of the Confederation of Textile Dyers and Finishers held in Manchester on 16 February: Dr. C. J. T. Cranshaw (a director of I.C.I.), Mr. John Rogers (chairman of I.C.I.) and Mr. P. N. Hoyle (English Velvets, Ltd.)

OVERSEAS

New U.S. Glass Centre

Construction of a Glass Centre at Corning, New York state, including a factory, research facilities, library, museum, and spectators' galleries is announced by the Corning Glass Works. The library on glass it is claimed will be the largest in the world. It is stated that it already has more reference works on glass than the British Museum, the Bibliotheque Nationale in Paris, and the Library of Congress in Washington. The museum will cover man's use of glass from its discovery to the present day. Visitors' galleries will give a close-up view of every step in the hand manufacture of glass, beginning with the first gathering of molten glass through the processes of blowing, shaping, cutting, engraving and polishing. The Centre will also house the original 200-inch, 20-ton telescope disc, predecessor of the one now in use at Mount Palomar Observatory in California.

Argentinian Oil Pipeline

The Argentine State Oilfields (Y.P.F.) have begun to build a pipe-line to carry petrol from the refinery at La Plata to the City of Buenos Aires, about 35 miles away. The line has been planned for a capacity of 3,000,000 litres per day, and the estimated cost is some 9,600,000 pesos. It is expected to be in service by next June.

U.S. Detergent Plant

One of America's largest and most complete manufacturing centres for a wide variety of detergents, vegetable shortening, and margarine, will be established at Pagedale, near St. Louis, Missouri, by the Lever Brothers Company, as part of a long-range, major construction and expansion programme. The expansion will start off with a $5,000,000 synthetic detergent plant and warehouse which will cover three acres of Lever's 27-acre site at Pagedale. The synthetic detergent plant will form a nucleus around which additional units will be built over a period of years, and is expected to be in operation early in 1952. The new plant will include three major buildings, a six-story processing unit, a three-story structure for packaging, and an electric sub-station.

Fewer Vital Metals

Industrial ingenuity in shifting to substitute materials is rapidly affecting American products as more and more essential metals are being set aside for the nation's defence. Use by the automobile industry of stainless steel for door handles, ornamentation and other surface parts is already being sharply curtailed. A leading manufacturer of vacuum cleaners is changing from aluminium to plastic handles. New irons will be about two lbs. heavier when sole plates are made of cast iron instead of aluminium. Curtailment of the use of cobalt will restrict enamelled finishes on cookers, refrigerators, and other household goods. A major producer of refrigerators is working with a ceramics organisation on a substitute for cobalt in porcelain enamels. A manufacturer of an automatic dishwasher is substituting steel for brass in 11 different parts.

American Foundrymen's Convention

The 55th Annual Convention of the American Foundrymen's Society will be held at Buffalo, 23-26 April, when four days of technical sessions on the various phases of casting ferrous and non-ferrous metals and patternmaking will be augmented by evening shop courses, round table luncheons and dinner meetings. Featured event of the Convention technical programme will be an all-day 'Symposium on Gating and Risering.' The principal technical address of the four-day programme will be the Charles Edgar Hoyt Annual Lecture, with James C. Zeder, director of Engineering and Research, Chrysler Corporation, Detroit, as speaker. Other featured papers to be presented at the Convention will include the Annual Exchange Paper of the Institute of British Foundrymen to the American Foundrymen's Society, 'Basic Cupola Melting and Its Possibilities,' to be presented by E. S. Renshaw, head foundry metallurgist, Ford Motor Co., Ltd., Dagenham, England, and the Institute of Australian Foundrymen's Exchange Paper, 'The Modification Technique of Aluminium-Silicon Alloys,' to be given by R. Dyke, metallurgist, Defence Research Laboratories, Marybirnong, Victoria.

Next Week's Events

MONDAY 26 FEBRUARY

The Institute of Fuel

Birmingham: The University, Edmund Street, 7.30 p.m. R. G. Temple: 'Underground Gasification of Coal.'

TUESDAY 27 FEBRUARY

The Institute of Metals

Swansea: Metallurgical Department, University College, Singleton Park, 6.30 p.m. J. S. Walton: 'Some Applications of X-Ray Crystallographic Methods to Quality Control in the Metallurgical Industry.'

WEDNESDAY 28 FEBRUARY

Society of Chemical Industry

London: Burlington House, W.1, 6.30 p.m. Paper presented by F. P. W. Winteringham: 'Radioactive Tracer Studies on the Fate of Insecticides.'

The Institute of Metals

Manchester: Engineers' Club, Albert Square, 6.30 p.m. W. Barr: 'Clad Steels.'

THURSDAY 1 MARCH

Society of Chemical Industry

Dagenham: South East Essex Technical College, Longbridge Road., 7 p.m. S. Price: 'Some Applications of Microbiology to Analytical Chemistry.' (Jointly with RIC.)

Bristol: The University, Woodlands Road, 7 p.m. Professor W. E. Garner: 'Solid and Catalytic Reactions with Reference to the Practical Problems of Industry.'

The Chemical Society

Sheffield: The University, Western Bank, 5.30 p.m. Professor F. E. King: 'The Chemistry of Extractives from Hardwoods.'

Hull: Science Lecture Theatre, University College, 6 p.m. Tilden Lecture by Professor F. S. Dainton: 'Atoms and Radicals in Aqueous Solution.'

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. Sir John Cockcroft, F.R.S.: 'The Work of the Atomic Energy Research Establishment.'

The Royal Institution

London: 21 Albemarle Street, W.1, 5.15 p.m. Sir Lawrence Bragg: 'Metal Physics.'

FRIDAY 2 MARCH

Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. Dr. J. G. A. Griffiths: 'Rockets and Chemistry.'

The Chemical Society

St. Andrews: Chemistry Department, United College, 5.15 p.m. Professor H. D. Springall: 'Analysis of Proteins and Amino-Acids.'

Non-Ferrous Metal Allocations

FRESH announcements on the allocation of non-ferrous metals were made by the Ministry of Supply on 15 February. Virgin zinc allocations in March will be at the same rate as this month, based on the monthly consumption during the first three-quarters of 1950 (THE CHEMICAL AGE, *63*, 213).

The allocation of imported virgin copper during March and April will be the same as during February—85 per cent of the average monthly consumption during the first six months of 1950.

Consumers may now order copper for delivery in both March and April up to the tonnage of their quota in February. Orders placed in February for delivery in April will be subject to the usual premium.

It was announced on 14 December, 1950, that orders for delivery subsequent to the month of order could not be accepted for more than two-thirds of the quota notified. This proviso is withdrawn for March and April.

Until further notice purchases of virgin lead from the Directorate of Non-Ferrous Metals will be restricted each month to a quantity not exceeding 90 per cent of the average monthly consumption in 1950. This has been made effective from 1 February.

Some concessions are likely to be made to non-ferrous metals manufacturers in an amended list of articles for which the use of zinc, copper, and their alloys is prohibited.

This was disclosed on 20 February in a joint statement issued after a meeting of the Midland Regional Board for Industry by Mr. Barry Kay, Regional Controller, Board of Trade, and Mr. S. A. Davis, Regional Controller, Ministry of Supply.

Two orders are to be issued shortly containing the new lists.

HOME

Analysts' Annual Meeting

The annual general meeting of the Society of Public Analysts and Other Analytical Chemists will be held at 3.15 p.m. on Friday, 16 March, in the meeting room of the Royal Society, Burlington House, Piccadilly, London, W.1. The meeting will be followed by the address of the retiring president, Mr. George Taylor, O.B.E. The Society will hold its 77th anniversary biennial dinner at the Hall of the Worshipful Society of Apothecaries of London, Blackfriars Lane, London, E.C.4, in the evening of the same day. The reception will be at 7 p.m. and dinner will commence at 7.30.

'The Chemical Age' Index

The Index to Volume LXIII of THE CHEMICAL AGE—covering the period July to December 1950—is now being printed. Copies may be obtained upon application to the Editor.

Sulphuric Acid Totals

Total production of sulphuric acid and oleum in the United Kingdom in 1950 was 1,802,699 tons and not 1,980,470 tons as reported in our issue of 10 February. This latter figure was the total capacity represented. Production during 1949 was 1,660,267 tons and the total capacity represented was 1,791,740 tons.

To Work Quarry

Permission to work limestone and other minerals at Tunstead Quarry, Chapel-en-le-Frith, Derbyshire, has been granted by Mr. Hugh Dalton (Minister of Local Government and Planning) to Imperial Chemical Industries, Ltd. There is a condition for screening the workings with trees. Mr. Dalton has pointed out Tunstead Quarry is the largest and one of the most up-to-date limestone quarries in Britain and is the nearest adequate source of supply of limestone to the alkali section of the chemical industry in mid-Cheshire.

Antimony Prices Raised

Prices of antimony were increased on 19 February, as follows. Figures in parentheses show the previous prices. Antimony crude £275 per ton (£250); refined 99 per cent, £360 (£325); refined 99.6 per cent £372 10s. (£337 10s.).

Scottish-American Co-operation

An agreement has been made for the exchange of interests, data and personnel between L. Sterne and Co., Ltd., of Glasgow, and the Tecumseh Products Co., Inc., of Michigan. The American company has taken over the Universal Cooler Company of America with which the Scottish firm had a similar arrangement. Sterne's will receive the benefit of advanced research work and technical developments originating in the U.S.A.

Work of the DSIR

Scientific problems of the DSIR were the subject of a paper delivered by Sir Ben Lockspeiser, K.C.B., F.R.S., to the Scottish branch of the Institute of Physics last week. Among the problems discussed were: Sulphate reducing bacteria and the formation of sulphur (Chemical Research Laboratory); the fluidised bed technique in chemical engineering (Fuel Research Station); and the use of ultrasonics in the determination of elastic constants of metal and elastic moduli (National Physical Laboratory).

Borax and Boric Acid Prices

The rise in prices announced by Borax Consolidated, Ltd. (THE CHEMICAL AGE, *64*, 273), comes into operation on 12 March next and not on 21 March as reported. It is regretted that Neobor (pentahydrate) which was increased by £2 10s. a ton was mis-spelt Neobar.

Secret Protective Coating

Mr. Harry Grimshaw, a Manchester chemist, claims to have devised a method of protecting clothing from some of the rays given off by an atomic explosion. It is a dark red plastic covering about 15,000th of an inch thick. The discovery is said to have been successfully tested by scientists at the Ministry of Supply's Department of Atomic Energy. There is still the problem of finding adequate protection against the greater penetrating power of *Gamma* rays. Equipment invented by Mr. Grimshaw's firm, James North and Sons, at their factory at Hyde, is already being used by workers at atomic research stations in Britain. The formula, still on the secret list, is a modification of a coating of poly-vinyl-chloride.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

J. I. DARNBROUGH (CHEMISTS), LTD., London, E. (M., 24/2/51). 22 December, £1,500 debentures; general charge.

PLASTIC FINISHES, LTD., London, E.C. (M., 24/2/51). 16 December, £5,500 (not ex.) mortgage and £100 (not ex.) mortgage by way of collateral security thereto, to Lloyds Bank, Ltd.; respectively charged on land with factory and buildings thereon Bridge Road, Camberley, and land north side.

Increases of Capital

The following increases of capital have been announced: BRITISH FELSOL CO., LTD., from £100 to £7,000; STANLEY R. EVANS, LTD., from £2,000 to £4,000; WALKDEN, MAKIN & CO., LTD., from £15,000 to £55,000; FISHBROOK DYEING CO., LTD., from £13,000 to £50,000; SHEFFIELD CHEMICAL CO., LTD., from £35,000 to £100,000.

Company News

Hilger and Watts, Ltd.

Consolidated trading profit of Hilger and Watts, Ltd., for the year ended 30 September, 1950, was £145,857 (£141,257). The directors recommend a dividend of 7½ per cent on the ordinary shares £9,281 (same).

Anchor Chemical Co., Ltd.

A marked improvement in earnings was shown in the report of the Anchor Chemical Co., Ltd., for the year ended 30 November, 1950. Trading profit was £103,496 as against £84,401 in the previous year. Final dividend 18¾ per cent on the ordinary shares making a total of 25 per cent. For 1949 the final was 26¾ per cent, making 40 per cent on the lower share capital before 100 per cent bonus share issue 16 June, 1950.

New Registrations

Chemicolours, Ltd.

Private company. (491,367). Capital £5,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: R. A. Pargeter, and A. N. Emanuel. Reg. office; 16 Union Court, Old Broad Street, E.C.2.

Davanti Preparations, Ltd.

Private company. (491,415). Capital £100. Manufacturing chemists, merchants, exporters, retailers and dealers in chemical preparations and compounds, etc. Subscribers: L. B. Cowan and R. Cowan. Reg. office: 34 South Molton Street, W.1.

Goldhawk Pharmacy, Ltd.

Private company. (491,377). Capital £100. Wholesale or retail consulting, analytical, manufacturing, pharmaceutical and general chemists, etc. Directors: R. Cieslawski and K. Blumhoff. Reg. office: 128 Goldhawk Road, Shepherds Bush, W.12.

M. W. Hardy & Co. (London), Ltd.

Private company. (491,543). Capital £1,000. Merchants and agents for dealing in articles, products and substances, particularly metals, chemicals, ores and mineral substances, etc. Subscribers: R. Strass, E. Cohn, E. F. Roscoe, and D. K. Harbottle. Solicitors: Crawley & De Reya, 1 Princes Street, W.1.

Lester Baker, Ltd.

Private company. (491,234). Capital £1,000. Chemical manufacturers, chemists, druggists, drysalters, etc. Directors: Mrs. V. Lester and G. R. Jarvis. Reg. office: 146 Bishopsgate, E.C.2.

South American Oil Production

Petroleum production in Chile during 1950 reached 600,000 barrels, and production for 1951 is estimated at 1,200,000 barrels. Columbian production of oil for 1950 was 34,000,000 barrels, valued at about $80,000,000 U.S. This exceeded the 1949 production figure by 4,000,000 barrels.

British Chemical Prices

LONDON.—Rising quotations with supplies short relative to the current demand characterise most sections of the industrial chemicals market and deliveries to home consumers are as great as output permits. In some cases the position continues to be aggravated by the scarcity of suitable drums. While a substantial export trade has been put through there remains a fair volume of unsatisfied overseas inquiry in circulation. There have been no important changes in the general run of the potash and soda chemicals and in other directions tartaric acid and citric acid supplies are tighter with the latter item 2d. per lb. dearer. The demand for the white and red leads continues steady with no further alteration in convention rates. The coal tar products market is fairly well sold forward and new business is difficult to place.

MANCHESTER.—There is evidence that the textile industries and some other outlets for industrial chemicals in the Lancashire area are feeling the effects of the shortage of sulphuric acid and certain other products. The demand for chemicals generally on the Manchester market during the past week has continued on steady lines and there has been no lack of fresh inquiry from both home users and from shippers. Deliveries under contracts are being called for steadily. There has been a fair demand for most of the fertiliser materials, while in the market for the tar products persistent pressure for creosote oil, cresylic acid and most of the light distillates has been reported.

GLASGOW.—There has been positively a a boom during the last week in the Scottish heavy chemical market, as owing to the many restrictions and shortage of supplies, most business concerns are probing every possible supplier for their requirements for stock to keep their production going. Export business is dull.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 1 ton, £69 ; 80% pure, 1 ton, £74 ; commercial glacial 1 ton, £82 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £118 per ton.

Acetone.—Small lots : 5 gal. drums, £105 per ton ; 10 gal. drums, £100 per ton. In 40/50 gal. drums less than 1 ton, £85 per ton ; 1 to 9 tons, £84 per ton ; 10 to 50 tons, £83 per ton ; 50 tons and over, £82 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots. d/d, 2s. 5d. per proof gallon ; 5000 gal. lots, d/d, 2s. 6½d. per proof gal.

Alcohol, Diacetone.—Small lots : 5 gal. drums, £133 per ton ; 10 gal. drums, £128 per ton. In 40/45 gal. drums : less than 1 ton, £113 per ton ; 1 to 9 tons, £112 per ton ; 10 to 50 tons, £111 per ton ; 50 to 100 tons, £110 per ton ; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER : Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER : £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £47 per ton.

Ammonium Chloride. — Grey galvanising, £27 10s. per ton, in casks, ex wharf. Fine white 98%, £21 10s. to £22 10s. per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate. — MANCHESTER : £5 5s. 6d. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £88 and £86 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots as to grade, etc., 1s. 9½d. to 2s. 4½d. per lb. Crimson, 2s. 6½d., to 3s. 3½d. per lb.

Arsenic.—Per ton, £44 5s. to £47 5s., ex store.

Barium Carbonate.—Precip., d/d ; 2-ton lots, £28 5s. per ton, bag packing, ex works.

Barium Chloride.—£38 to £38 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £29 10s. per ton d/d ; 2-ton lots, £29 15s. per ton.

Bleaching Powder.—£19 10s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £54; in 1-cwt. bags, commercial, granular, £34 10s.; crystal, £37; powder, £38, extra fine powder, £39; B.P., granular, £44; crystal, £46; powder, £48-£48 10s.; extra fine powder £48.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £62; crystal, £69; powder, £66 10s.; extra fine powder, £68 10s.; B.P., granular, £75 10s.; crystal, £81; powder, £78 10s.; extra fine powder, £80 10s.

Butyl Acetate BSS.—£156 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£143 per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid £9 12s. 6d. per ton, in 4-ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£28 10s. per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Per lb., d/d buyers' premises, for 5 cwt. or over, anhydrous, 1s. 9d. plus 10%, other, 1s. 9d.; 1 to 5 cwt., anhydrous 1s. 9½d. plus 10%, other 1s. 9½d. Higher prices for smaller quantities. All subject to a trade discount of 5%.

Cobalt Oxide.—Black, delivered, 9s. 10d. per lb.

Copper Carbonate.—MANCHESTER: 2s. per lb.

Copper Chloride.—(63%), d/d, 2s. 2d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(63%), d/d, 2s. 1d. per lb.

Copper Sulphate.—£69 15s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £12 12s. per 10 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £114 per ton.

Formaldehyde.—31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £66 to £67 10s. per ton, carriage paid.

Glycerin.—Chemically pure, double distilled 1,260 s.g. 227s. 6d.—230s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; bulk carriage paid.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 18s. per lb. in cwt. lots.

Iodoform.—22s. per lb.

Iron Sulphate.—F.O.R. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale tech., £105 per ton; dark tech., £95 per ton ex works; barrels returnable.

Lead Acetate.—White: £146 10s. per ton.

Lead Carbonate.—Nominal.

Lead Nitrate.—£133 10s. per ton.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £155; orange lead, £167. Ground in oil: red, £175 10s.; orange, £187 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £162 per ton. Ground in oil: English, under 2 tons, £179.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82%, ton lots, d/d, £22 to £25 per ton.

Litharge.—£155 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £74 5s.; cwt. lots £82 10s. per ton d/d.

Magnesium Chloride.—Solid (ex wharf), £15 per ton.

Magnesium Oxide.—Light, commercial, d/d, £187; cwt. lots £192 10s. per ton d/d.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 10s. 8d.; smaller quantities dearer.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

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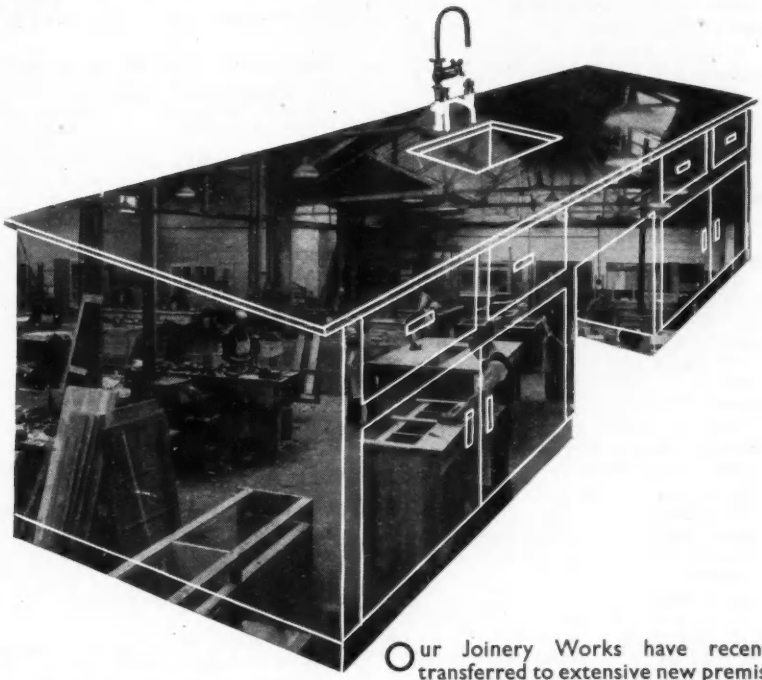

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Paraffin Wax.—From £58 10s. to £101 17s. 6d., according to grade for 1-ton lots.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £67 10s. per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 2½d. per lb.

Phosphorus.—Red, 3s. per lb. d/d ; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £88 10s. per ton for 1-ton lots ; flake, £105 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate.—Crystals and granular, 10⅝d. per lb. ; ground, 11⅝d. per lb., for not less than 6 cwt. ; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £88 10s. per ton for 1-ton lots, ex store ; hydrated, £81 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96%, 6-ton lots, £16 10s. per ton.

Potassium Iodide.—B.P., 16s. 2d. per lb. in 28 lb. lots.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 6d. per lb. ; technical, £6 13s. to £7 13s. per cwt. ; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—Dog-tooth crystals, £72 10s. per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid.—MANCHESTER : 2s. to 3s. 4½d. per lb. d/d.

Soda Ash.—58% ex depôt or d/d, London station, £8 17s. 3d. to £10 14s. 6d. per ton.

Soda, Caustic.—Solid 76/77% ; spot, £18 4s. per ton d/d.

Sodium Acetate.—£49-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 9d. per lb. ; anhydrous, 9¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite.—Powder, 60/62%, £29 12s. 6d. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100% basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £23 2s. 6d. a ton ; commercial, 1-ton lots, £21 12s. 6d. per ton carriage paid.

Sodium Iodide.—B.P., 17s. 3d. per lb., in 28 lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £114 ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98%, 6-ton lots, d/d station, £23 per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 17s. 9d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £34 10s., anhydrous, £65 ; tri-sodium, crystalline, £32 10s., anhydrous, £70.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot. £25 15s. per ton, d/d, in drums ; broken, £27 5s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton ; pea crystals, £20 10s. per ton d/d station in kegs ; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £15 11s. 6d. to £17 16s. 6d. according to fineness.

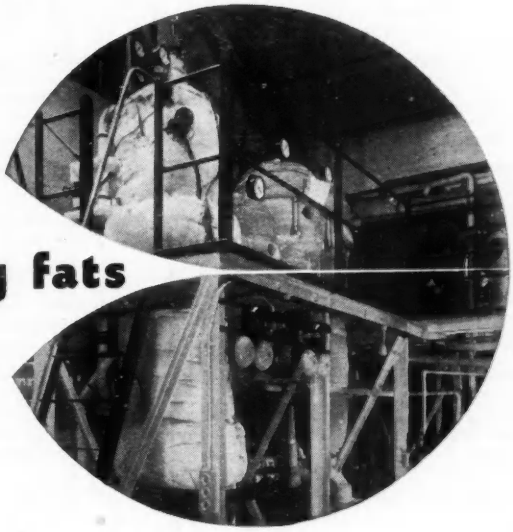
Tartaric Acid.—Per cwt. : 10 cwt. or more, £15.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d (56-lb. bags), £122 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d ; white seal, £172 10s. ; green seal, £171 ; red seal, £170.

Zinc Sulphate.—Nominal.



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Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £11-£11 10s. per ton.

Cadmium Sulphide.—About 20s. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£64 10s. per ton.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10-⅝d. to 1s. 5¾d. per lb. ; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £54 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, £12 18s. 6d.

Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. Special No. 1, £20 14s.

"Nitro-Chalk."—£12 9s. 6d. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £19 17s. 6d. per ton.

Coal-Tar Products

Benzol.—Per gal, ex works : 90's, 3s. 3d. ; pure, 3s. 5½d. ; nitration grade, 3s. 7½d.

Carbolic Acid.—Crystals, 1s. 1¾d. to 1s. 3½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER : Crystals, 11¾d. to 1s. 1½d. per lb., d/d crude, 5s. 4d., naked, at works.

Creosote.—Home trade, 8d. to 10½d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale 98%, 4s. 0d. per gal. ; 99.5/100%, 4s. 10d. American, duty free, for export, 9s. 0d., naked at works. MANCHESTER : Pale, 99/100%, American, duty free, 7s. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra : higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £17 to £20 per ton according to m.p. ; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works ; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 115s. per ton f.o.r. suppliers' works ; export trade, 120s. per ton f.o.b. suppliers' port. MANCHESTER : £5 10s. f.o.r.

Pyridine.—90/160°, 23s. per gal. MANCHESTER : 20s. to 22s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal. MANCHESTER : Pure, 3s. 2d. per gal. naked.

Xylol.—For 1000-gal. lots, 4s. 0½d. to 4s. 3d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton ; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

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Wood Tar.—£6 to £10 per ton.

Intermediate and Dyes (Prices Nominal)

***m*-Cresol 98/100%.**—Nominal.

***o*-Cresol 30/31° C.**—Nominal.

***p*-Cresol 34/35° C.**—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb. ; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 11d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb. ; P.G. 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Chemical & Allied Stocks & Shares

REINVESTMENT of the proceeds of selling the nationalised steel stock has provided stock markets with a large volume of business. Investors are exchanging out of steel stock into industrial and other shares giving a similar yield to their old shareholdings in the steel companies. The new steel stock has been at a discount of over £2 to the issue price of £100, but at the time of writing the discount has narrowed to 35s. Reinvestment money has gone largely into rearmament and allied shares, but commodity shares have also been favoured, notably rubbers because pending dividends are expected to show big increases owing to the effect on profits of the rise in the price of the commodity. This is now at its highest since as far back as 1910. The view prevails in the City that markets are likely to remain active until April when Budget fears may modify some of the optimistic dividend hopes now gaining ground.

Chemical and kindred shares reflected the firmness and activity ruling in the industrial section of the Stock Exchange. Imperial Chemical at 45s. 1½d., however, have not held best levels, but Monsanto on higher dividend talk remained firm at 54s. 9d. Fisons were 27s., the yield of over 6½ per cent attracting attention in this case. Albright & Wilson 5s. shares have been active around 16s. 9d. in response to dividend estimates, while Brotherton were 21s. 3d., Laporte Chemicals 5s. units 11s. 10½d., and British Alkaloids 1s. shares were 4s. 9d. F. W. Berk at 14s. 3d. have responded to the bonus proposals. Amber Chemical were 2s. 6d. and William Blythe 3s. shares changed hands at 9s. 3d. In other directions, W. J. Bush were quoted at 90s. and Burt Boulton & Haywood at 27s. 6d. British Glues & Chemicals have risen further to 24s. 9d.

Borax Consolidated at 61s. 3d. were higher, awaiting the financial results. British Aluminium (43s.) and British Oxygen (96s. 6d.) showed firmness, and Turner & Newall were 91s. 6d.; but elsewhere, United Molasses have eased to 56s. the market apparently now being less hopeful of a bonus. Triplex Glass 10s. units moved higher at 26s. 6d. and United Glass Bottle at 85s. were helped by market talk of higher dividend or share bonus prospects. Associated Cement at 92s. 3d. again reflected higher dividend hopes, and paint shares were generally firm with Pinchin Johnson higher at 41s. 6d. Lever & Unilever at 45s. kept well maintained, and Glaxo Laboratories have been active and higher at 64s. 3d.

There has been a big business in engineering shares, due to reinvestment of proceeds of selling of steel stock by investors. Guest Keen were 53s. 3d., and in other directions Powell Duffryn have been active around 34s. although best levels were not held. Courtaulds were better at 40s.

Movements among shares of companies connected with plastics were mostly small.

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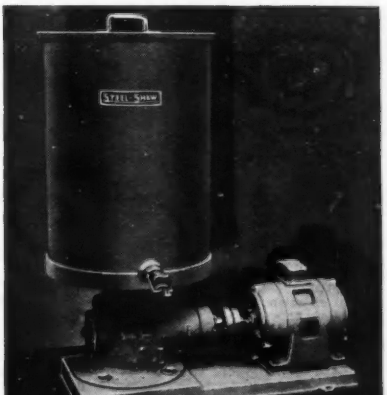

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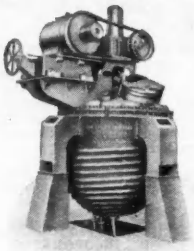

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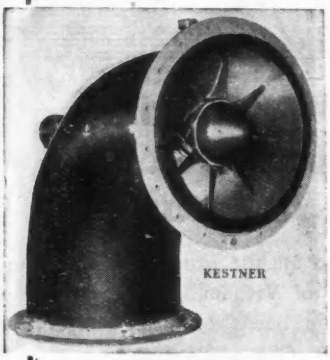

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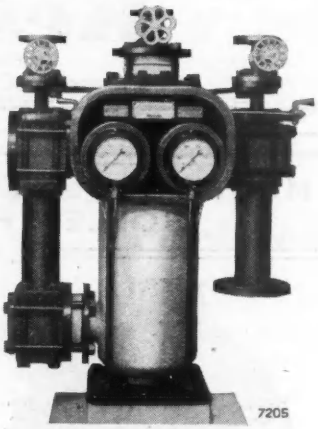

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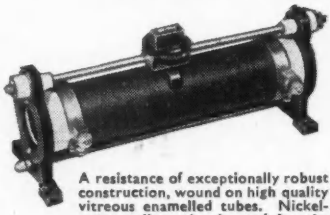

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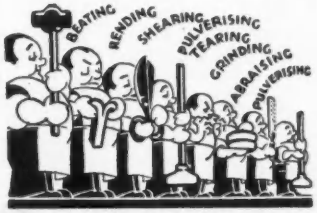

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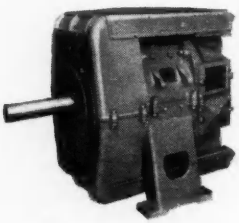

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